Minimalist QRP Book

by
IZ3AYQ

V5.3

Pixie transceiver, 7023 kHz, 900 mW in a modem box.

This manual is for free distribution and for amateur radio use; any commercial use is prohibited.

A big thanks to Oleg Borodin, RX3G, for the RTX projects he provided me, and for the continuous stimulus in QRP activities.

Why this book?

This book aims to collect and share knowledge related to the art of QRP. There are many schemes and projects available on the web, but after some time some schemes disappear if the sites are no longer maintained.
It is therefore a question of collecting this knowledge and trying to give as complete an overview as possible of this branch of radiantism.

Last but not least, the projects are minimalist, not because you can't do better, but because:

- An amateur radio operator should use the **minimum necessary power** to make a QSO;
- Because they are affordable designs, usually feasible **without special electronic equipment;**
- Because the great **satisfaction lies in building and using something of one's own**, rather than just using super equipment, even very beautiful ones, but which can only place us as users of a technology we master very little;
- Because they are an important **stimulus to learn**, and you learn from the basics.
- Because they are a base that you can **modify at will**, introducing endless improvements.
- Because with a simple design I can find **the components more easily**.
- Last but not least because making links in QRP, QRPp or QRPx is a **challenge and a lot of fun together**.

RA7RA
П416 Ge pnp 50 mW
14060 Vanguard TX

I invite those who are passionate about downloading the diagrams and documentation available on the Internet; in fact, if you see and try to search, after a few years some sites are no longer maintained and online, so even the diagrams are lost over time. So it's not a bad thing to download and keep them, not throwing away that heritage of tests, trials and experience that other radio amateurs have done before us. I think that these circuits are a story that we have to preserve, because they represent a heritage and a stimulus to do and understand more.

Summary

Minimalist RTX QRP, QRPp and QRPx 8
What we can do with low power 9
Transceivers 10
MICRO80 10
The Micro 80 D 12
PIXIE, PIXIE2 14
Another Pixie for 80 m: 15
The Chinese Pixie 18
Another Chinese Pixie 19
40 m FT8 by BD6CR 19
KNIGHT SMITE: 21
TINY TORNADO 22
1 WATTER 25
80 m CW Transceiver XBM80-2 25
FOXX-2 26
THE TENNER & THE PIPIT 27
THE 49'ER 29
Uu80b Transceiver by G3XBM 30
Curumin by PY2OHH and modification by ON4XMJ 30
4SQRP Cricket 80a 31
The 10 m Lesser Chirpy 32
FET Transceiver 80 m by G3XBM 33
Wispy-10 WSPR RTX 34
VK2ZAY version of XBM80-2 35
1944 one tube TRX 35
One tube amateur station, by W9SCH 36
The Bell Ringer, 20 m RTX by AA1TJ 37
The MAS-Transceiver by DK1HE 38
The Pititico 38
The JU-6 7-14 MHz Transceiver by G3DOP 39
RTX Polevik by RA3AAE 40

RTX Polevik 20 + 40 by R2DNN 40
TRX 40 m by R2DNN 41
MAS 2013 42
One transistor transceiver by KV6Z 42
HA4OO Transceiver 43
DSB microtransceiver 43
DSB microtransceiver 21 MHz 44
The Gnat 40 RTX 45
Polish NE612 DSB Transceiver 46
Mosquito TRX 48
Transmitters 49
THE OXO: 49
30 m QRPp TX by DL6ZB 50
THE NOGAnaut 51
VA3IUL TX 51
LU1AR RTX 10W 80m 52
The Michigan Mighty Mite 53
The Vanguard 54
One BJT Transmitter by K4TWJ 55
One Watt CW Transmitter 56
Ten Minute Transmitter 56
Four States QRP 57
One BJT Transmitter 700 mW 57
TX 5 MHz 58
Little Joe 59
TX and power amplifier 60
The Walnut TX by PA3DMI 60
Valvular TX 61
Emergency transmitter – A 8 components 10W 40m/30m TX by SV3ORA 62
Russian transmitter “Paloma” 63
20 m 1 tube QRP Transceiver by UY1IF 64
Receivers 65
MTRX-20 65
MRX-30 66
MRX-40 67
1,5 V DC Receiver by DL6ZB 68

1 CHIP RX 80 m by G0FGI 68
A REGEN RECEIVER: 69
Russian DC RX 69
Russian DC RX 2 70
RX 69 70
Tiny SDR by LY1GP 71
Sudden Storm Receiver 72
The “Micro-Scope” - very simple 20 m D.C. RX for portable operation 73
Utilities 75
Il Super VXO 75
Audio Amplifier 75
S-meter circuit 77

Minimalist RTX QRP, QRPp and QRPx

Meaning of the terms:

QRP: power used less than or equal to 5 watt
QRPp: power used less than or equal to 1 watt
QRPx: power used less than or equal to 100 milliwatt
QRPu: power used less than or equal to 10 mW
Microwatting: power used less than or equal to mW

If it is possible to make connections in QRP (power of 5 watts or less) it is also possible to make them with 1 watt or less; this is the characteristic of QRPp. On the web you can find a lot of connection experiences made with 0.5 - 1 watt, often with self-built RTX. Very often simple wired antennas are used, and of course telegraphy (but there are also digital modes, which use communication protocols that allow transmission over thousands of kilometers with a few milliwatts). Of course, it is a great satisfaction to connect, for example, a station with a power of 700 watts and 9 element yagi antenna, with just 2 watts and a wired antenna! These connections are possible if the correspondent is patient, and especially if he does not require signals of the 9++ type.

Let's see why connections are possible even with little power, with a table expressing the signal level received from the correspondent starting from the transmitted power (~ means about, as the numbers have been rounded).

POWER	100 WATT	5 WATT	2 WATT	1 WATT	0,1 WATT
Received signal	9	7	6	5,5	4
Received signal	8	6	5	4,5	3
Received signal	7	5	4	3,5	2
Received signal	6	4	3	2,5	1
Received signal	5	3	2	1,5	0

The table means, for example, that if in a connection with 100 watts I make myself heard with signal 8, lowering the power to 1 watt, I can make myself heard with signal about 4.5, all other conditions being equal.

It is therefore evident that there are, band noise permitting, many possibilities to make connections both in QRP and with lower power.

Moreover, using telegraphy, I have many more possibilities to make myself heard than with the voice (USB and LSB). Not to mention digital protocols such as FT8, JT65 and others that allow to operate with even lower power.

What we can do with low power

This is an example of stations using less than 100 mW or less than 10mW or less than 1 mW. Hundreds of entities DXCC !!!! Hundres of grids!!! So, it is really possible, and even 5 watt seem to be too much !!! In the last table you can see RX3G with 13 entities DXCC and OM6TC with 1 entity with a power of about half milliwatt.

QRP-X means less than 100 mW output (QRP Extreme)
Send your results by e-mail - rx3g@mail.ru

Nr	CALL	ODX kms	DXCC	WW Fields	WW Grids	Remarks
1	UY1IF	9491	58			GT311 @ 80 mW, 74HC240 @ 80 mW, Dipole/Sloper, LW 41m, Vertical
2	RX3G	6092	55	18	192	TRX K2-mini @ 10...80 mW, 3 el Yagi, GP
3	R1BGK	4513	15	6	15	<100 mW, G5RV
4	R2DGZ	3873	30	16	133	50 & 85 mW FT-817 + 1:100 & 1:6 att., LW, GP, Gnome (JT65, PSK)
5	OM6TC	3663	31	12	51	76 mW FT-817 + att, LW 163 m
6	DL3YEE	3352	4	4	4	FT-818 + attenuators <100 mW, Mag Loop 90 cm dia
7	R1AR	3279	16			RS-978 80 mW GP, IV
8	R1LB	2915	9	12	16	BC108a 80 mW, tcvr Storch 90 mW, V-beam 2x42 m
9	RW3DF	2498	11	3	13	TX GT308, 80 mW, 3 el Yagi
10	OO7Z	2358	10			40 mW "Vanguard" Ge pnp 1T308, TX-2 less than 100 mW, Inv V
11	LZ2DQ	2343	8	7	9	Mini-SW2016 + 20 dB att = 50 mW, Delta 20 m @ 7 m AGL
12	RV9WEC	2313	15	2	3	<100 mW, FT817 + attenuator, 21 m Fuchs (40/20/15 bands)
13	F5GSK	2278	7			28 mW, L-doublet
14	UA1CEG	2069	1	1	1	20 m TX 95 mW, Long Dipole
15	RA7RA	2010	3	3	3	Vanguard TX 72 mW (P416), vertical BTV-4
16	ON6WJ	1998	4	4	4	AF116 Ge pnp Vanguard TX 80 mW, DC RX, 3 el Yagi
17	UI7K	1995	4	5	5	1 volt TX 50 mW
18	R1OA	1940	1	1	1	KT603 60 mW, GP, Dipole
19	EW6X	1767	9	9	9	SMD one transistor TX 7030 kHz 80 mW, Zeppelin
20	YU7AE	1620	3	3	3	GT320B p-n-p 50 mW, 14060 VXO, Windom
21	DL6YYM	1620	4		4	TX 50 mW, vertical, LW 26 m
22	G4UDG	1372	3	2	4	50 mW Ge pnp transistor
23	UN7AW	1259	1	1	1	TX KT603 <100 mW
24	DL6ZB		2			2N3904 @ 40 mW, 2x14 m Doublet

QRP-U means less than 10 mW output (QRP Ultra)

Nr	CALL	ODX kms	DXCC	WW Fields	WW Grids	Remarks
1	RX3G	3574	31	10	57	K2-mini @ 500 uW...8 mW, 3 el Yagi, GP
2	OM6TC	3351	13	7	15	2,8...7 mW LW 163 m
3	R1AR	3279	1			<10 mW, GP, LW
4	F5GSK	2276	2			6 mW, L-doublet
5	DL6YYM	1620	3			TX <10 mW, vertical, LW 26 m
6	R1BGK	1550	2	1	2	<10 mW, G5RV

Microwatting, 1 mW or less output

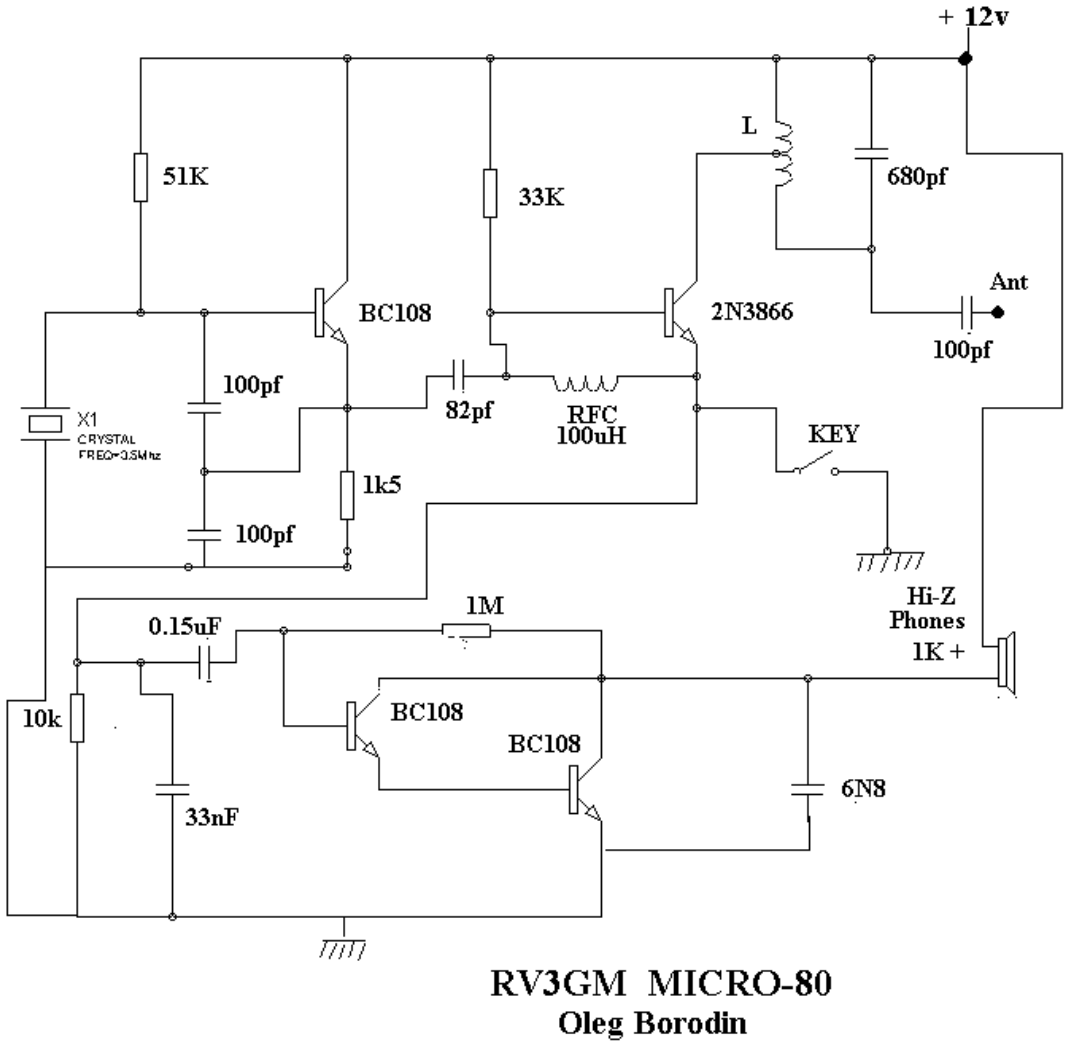
Nr	CALL	ODX kms	DXCC	WW Fields	WW Grids	Remarks
1	RX3G	2345	13			K2-mini @ 500 uW...1 mW, 3 el Yagi, GP
2	OM6TC	850	1	1	1	400 uW, LW 163 m

Last update – December 3, 2020

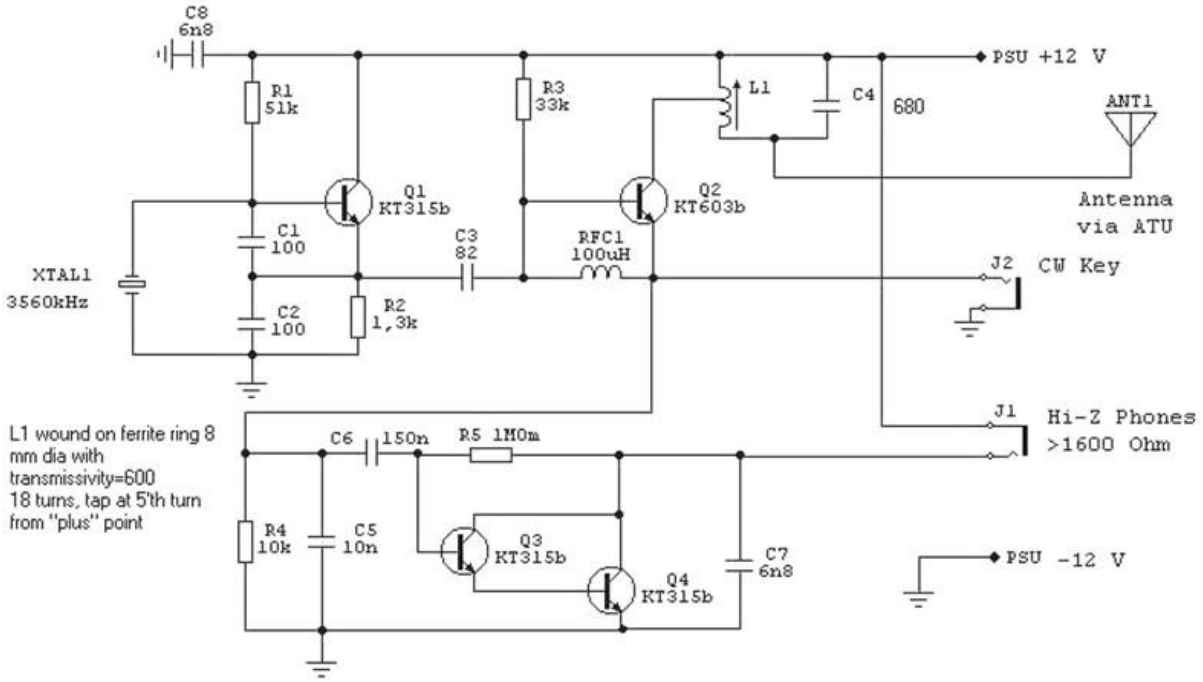
Transceivers

MICRO80

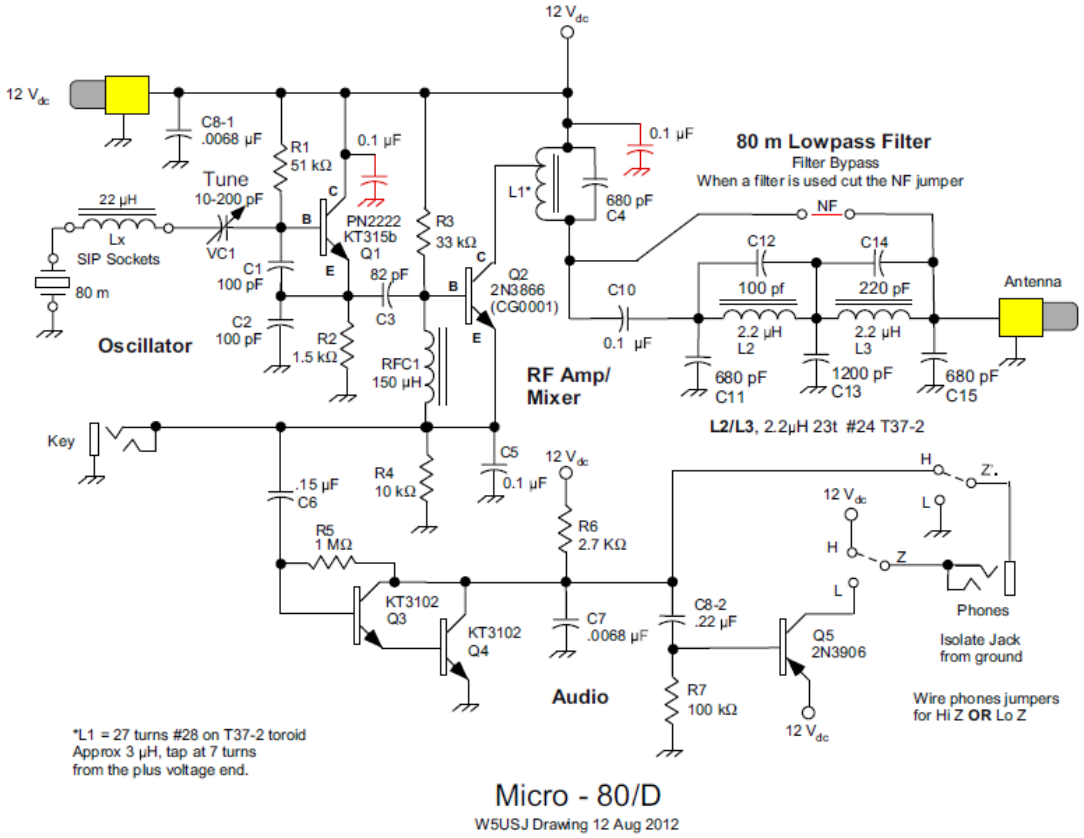
RTX by RV3GM, Oleg Borodin: RTX for 80 meters, single quartz frequency, only 4 transistors, 300 mW power, direct conversion receiver. Also possible for 40 and 30 meters, always with quartz on QRP frequency. Simple and minimalist. I report first this transceiver, because it is the progenitor of a long series.



Here is another scheme with different transistors, always for the 80 meters:


C8
6n8
R1
51k
R3
33k
L1
C4
680
PSU +12 V
ANT1
Antenna
via ATU
Q1
KT315b
Q2
KT603b
C1
100
C3
82
RFC1
100uH
XTAL1
3560kHz
C2
100
R2
1,3k
J2
CW Key
J1
Hi-Z Phones
>1600 Ohm
L1 wound on ferrite ring 8
mm dia with
transmissivity=600
18 turns, tap at 5'th turn
from "plus" point
C6
150n
R5 1M0m
R4
10k
C5
10n
Q3
KT315b
Q4
KT315b
C7
6n8
PSU -12 V

The Micro 80 D



Micro - 80/D

W5USJ Drawing 12 Aug 2012

Micro80/D
Minimalist 80m Transceiver

R1 = 51K (grn-brn-org)
R2 = 1.5K (brn-grn-red)
R3 = 33K (org-org-org)
R4 = 10K (brn-blk-org)
R5 = 1M (brn-blk-grn)
R6 = 2.7K (red-vio-red)
R7 = 100K (brn-blk-yel)

L2 & L3 = 2.2uh (red-red-slv) (Qty.2)
Lx = 22uh (red-red-blk)
RFC1 = 150uh (brn-grn-brn)

3.560 Mhz crystal

Q1 = KT315b transistor
Q2 = 2N3866 transistor (CG0001)
Q3 & Q4 = KT3102 transistor (Qty.2)
Q5 = 2N3906 transistor

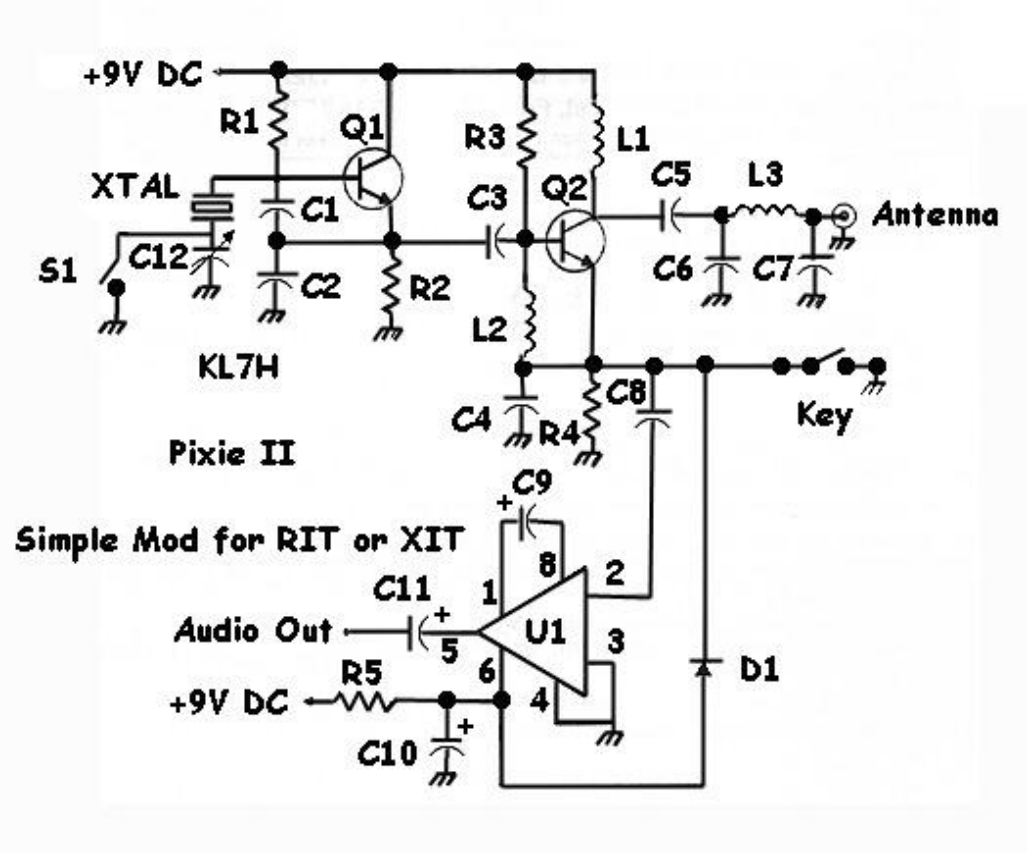
C1, C2 & C12 = 100pf (101) (Qty.3)
C3 = 82pf (820)
C4, C11 & C15 = 680pf (681) (Qty.3)
C5 & C10 & MODS = .1uf (104) (Qty.4)
C6 = .15uf (154)
C7 & C8-1 = .0068uf (682)
C8-2 = .22uf (224)
C9 = unused
C13 = 1200pf (122)
C14 = 220pf (221)
VC1 = 60/140 polyvaricon
1/4" x 1/4" spacer
1/4" shaft knob
2.6mm x 10mm bolt
2.6mm x 3mm bolt (Qty.2)
RCA jack (Qty.2)
stereo jack (Qty.2)
8 pin SIP socket
T37-2 toroid (Qty.3)
48" 28 ga. Magnet wire
printed circuit board

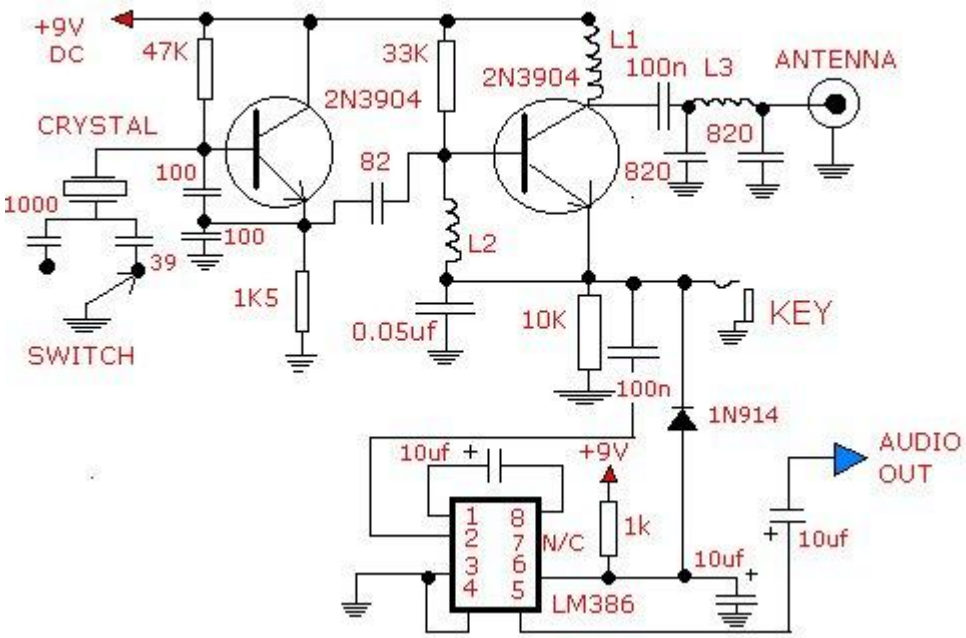
PIXIE, PIXIE2

RTX Pixie: we find many versions, for 80, 40, 30, 20, 15, 10 meters. It is a simple evolution of the Micro80. Power about 1 watt or less, single quartz frequency, direct conversion; in some schemes we use a VXO, which gives some kHz more bandwidth; as audio amplifier we use the LM386; some schemes have the automatic RIT for +/-700 Hz reception.

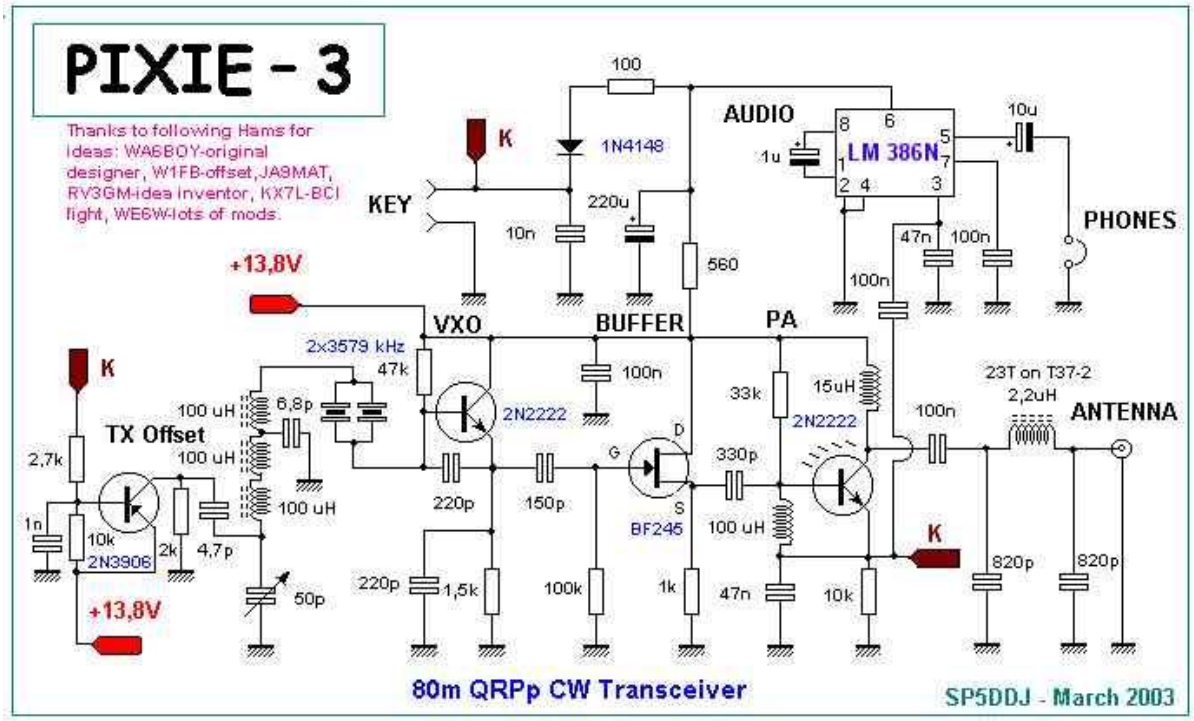
It is a simple circuit, subject to many improvements and modifications. Many OM have tried and many have written on Pixie: KA8MAV, KX7L, F6BQU, AL7FS, KL7ILX, WE6W, W1FB, KL7AQL, WA6BOY, JA9MAT and many others.

There are several QRP clubs that have published documentation on this small transceiver: I remember the G-QRP that published "The Pixie File" a pdf with a collection of schematics, easily available on the internet. Generally these RTXs suffer from strong input signals, especially broadcasting, because they don't have narrow front end filters, but everyone can work on this! Here is a series of diagrams.

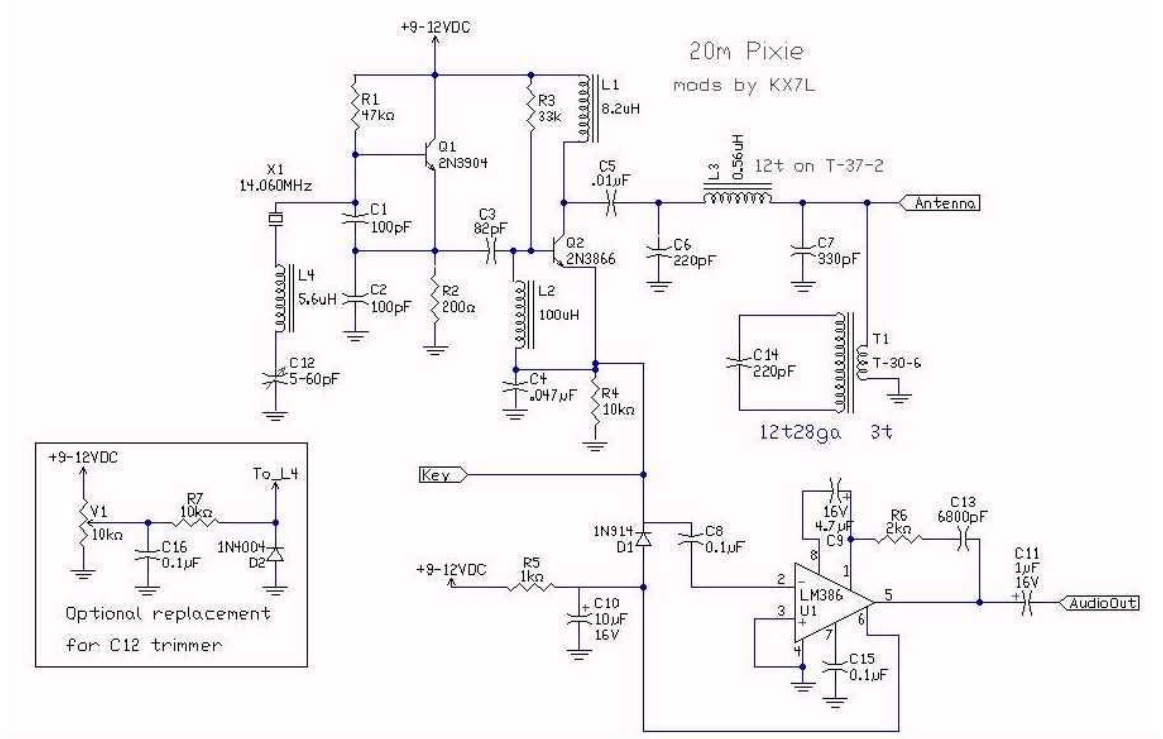




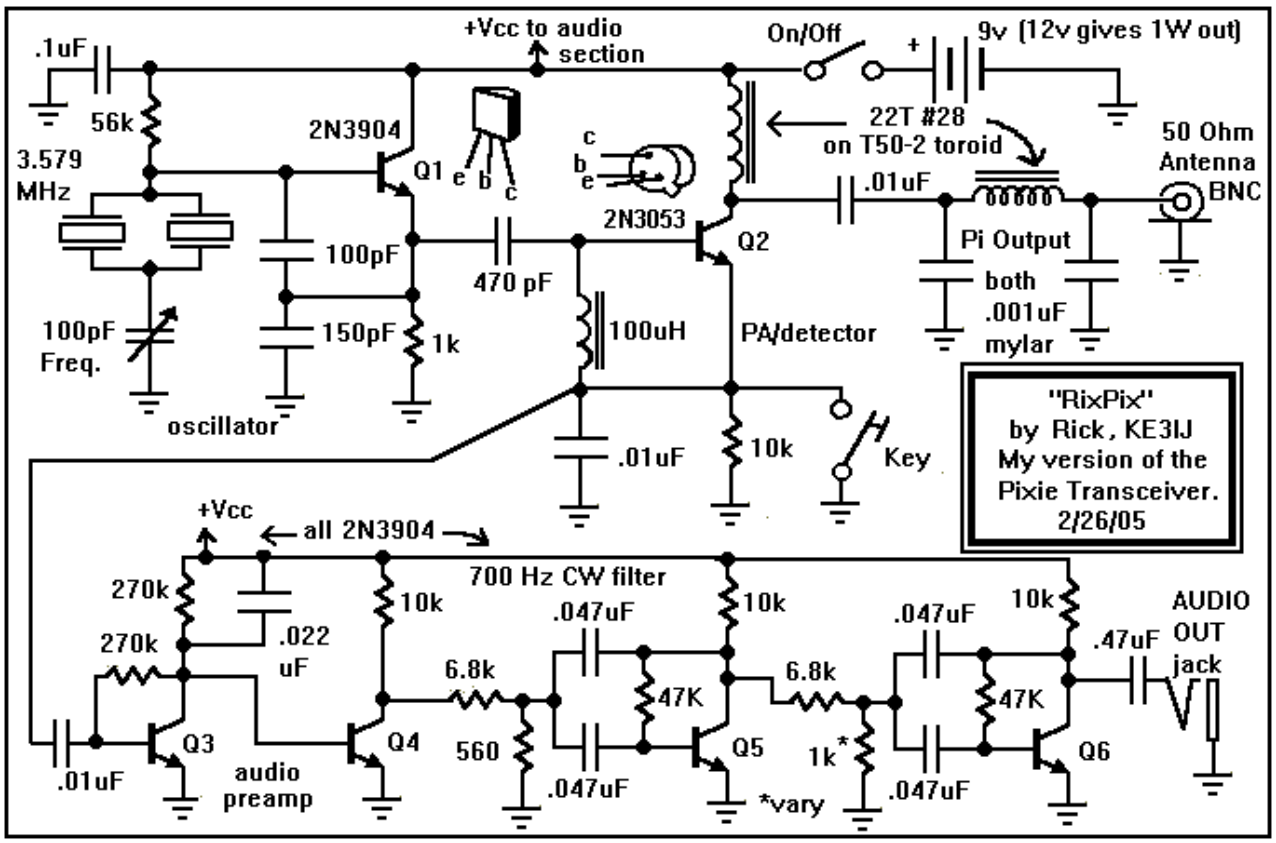
Another Pixie for 80 m:



Pixie for 80 m by SP5DDJ; with TX offset, with super VXO and Buffer.



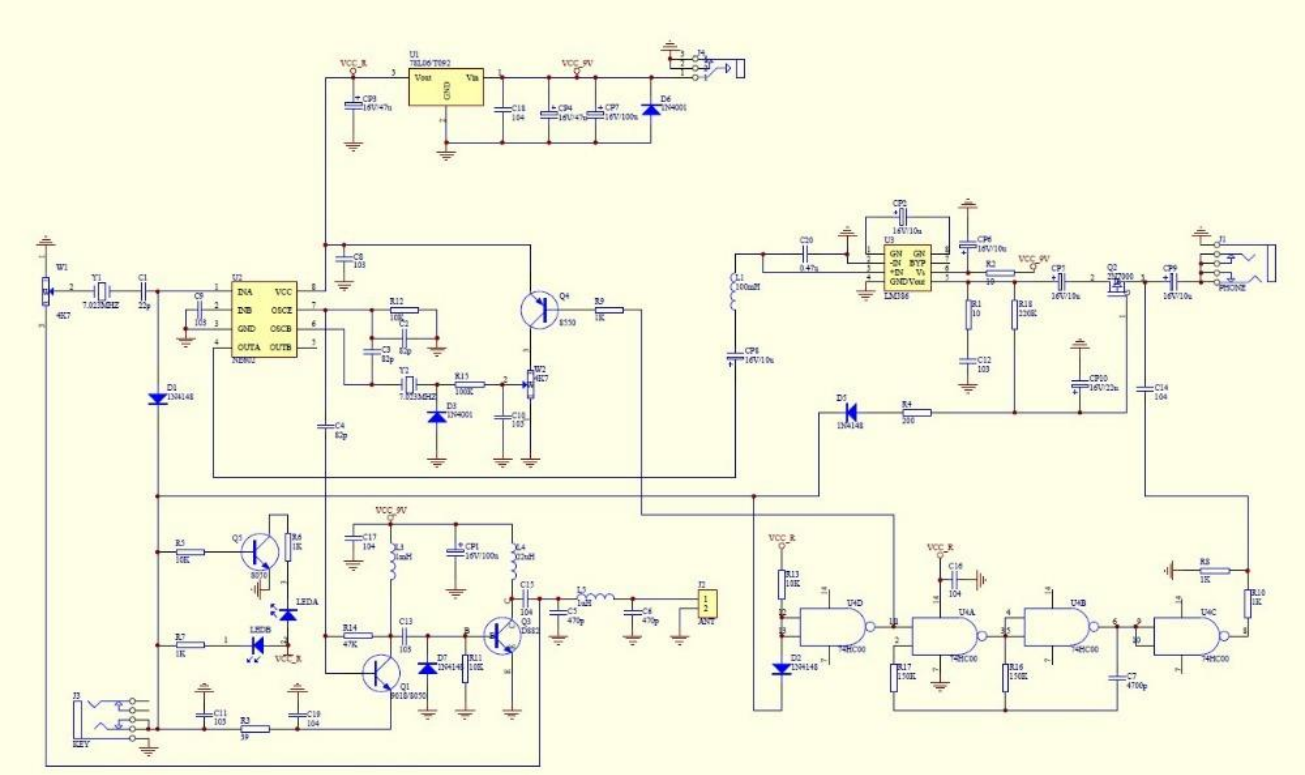
Pixie by KX7L



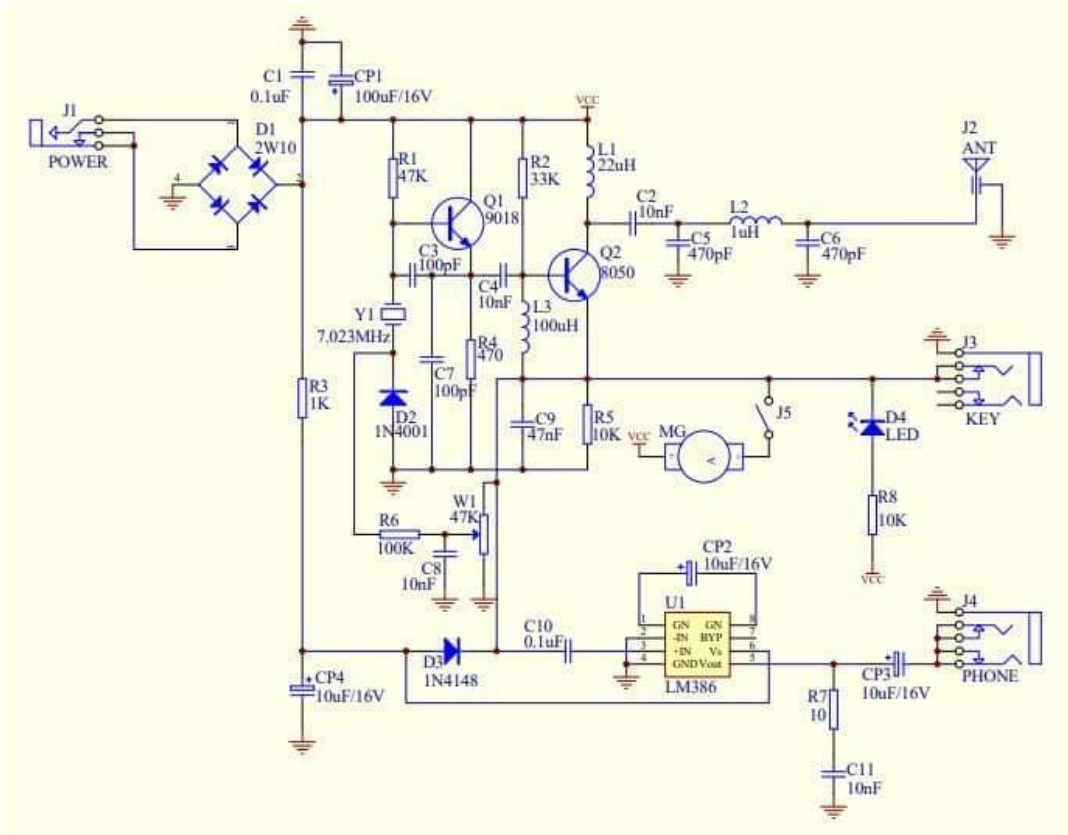
Pixie by KE3IJ: the “RixPix”

The Chinese Pixie

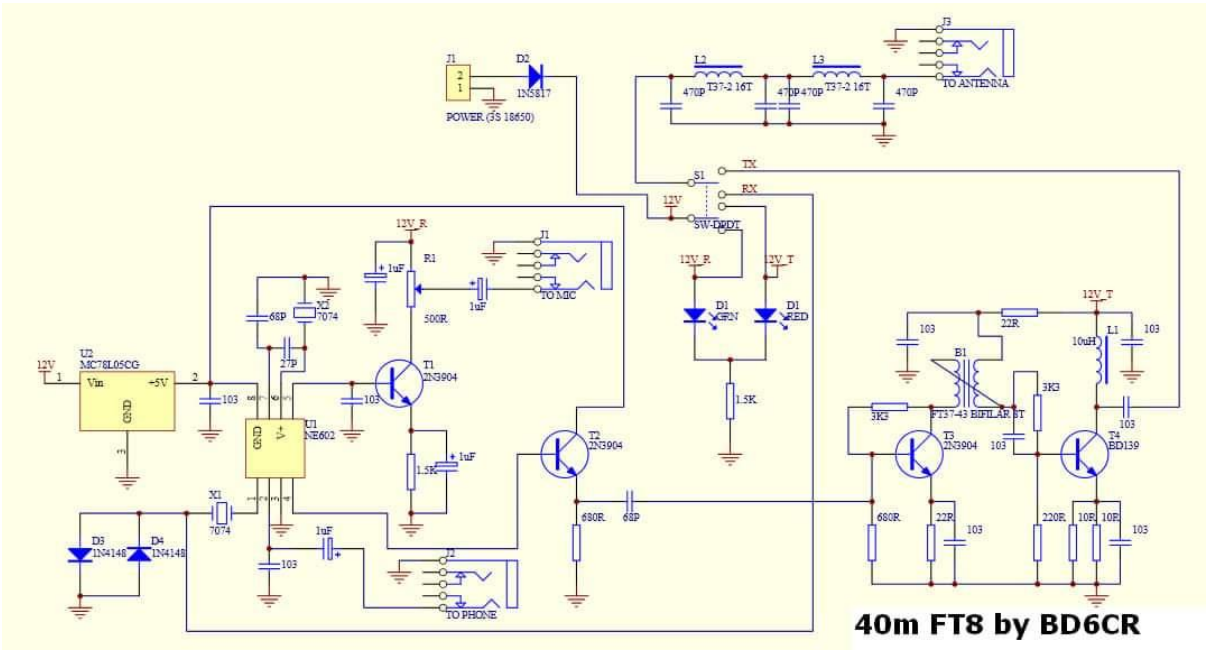
The Chinese version of Pixie, which can be found in Ebay: this version of Pixie (similarly to Rock Mite, which was born first) has a quartz in series at the input of the receiver, always on the frequency of 7023 kHz, identical to the receiving frequency, in order to reduce the bandwidth and therefore the noise and interference, as much as possible (it is the quartz in front of the NE602 integrated). The NE602 mixer and oscillator allows a gain of about 18 dB; the same integrated is used in many similar schemes and in particular in RockMite.



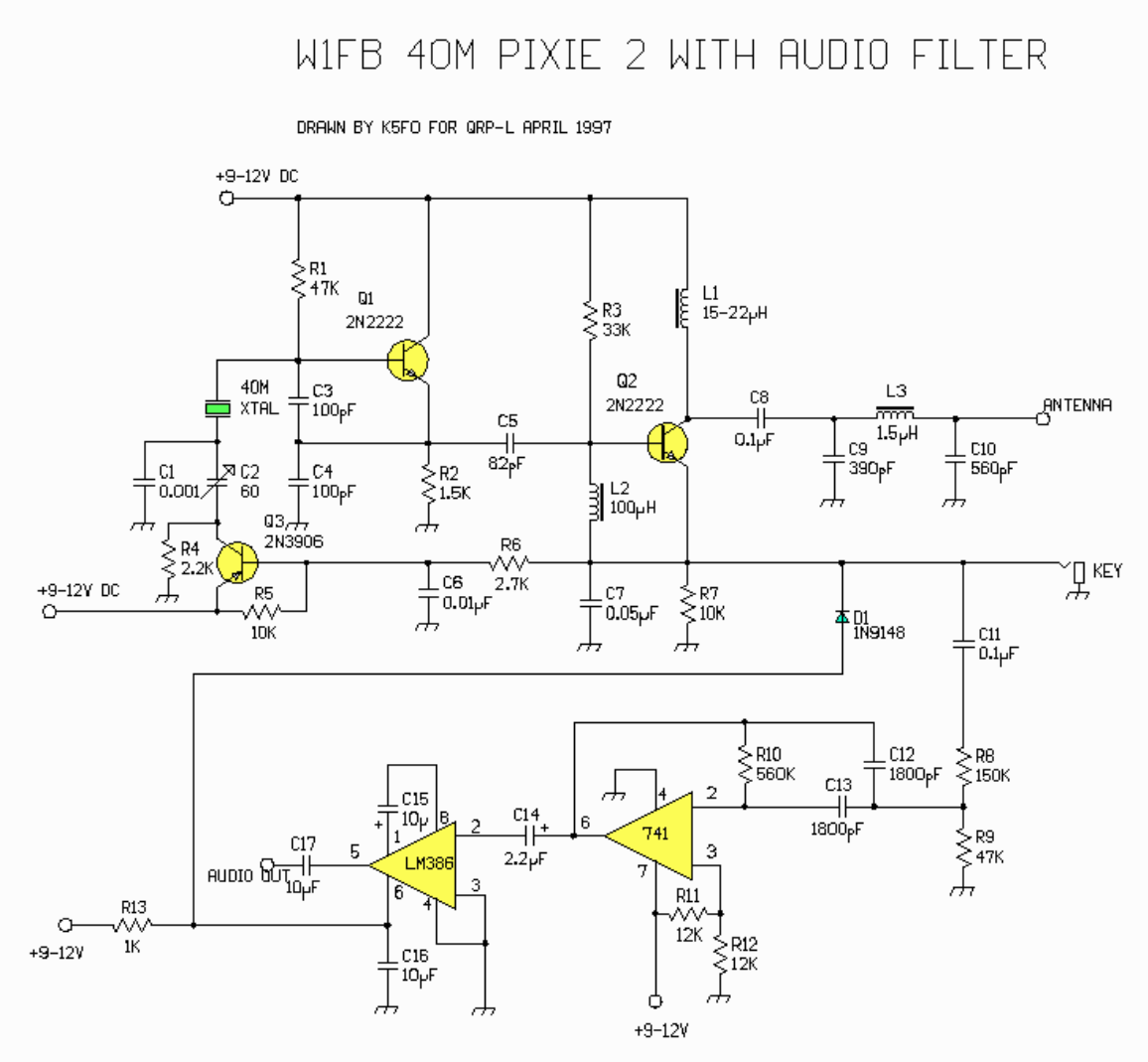
Another Chinese Pixie



40 m FT8 by BD6CR

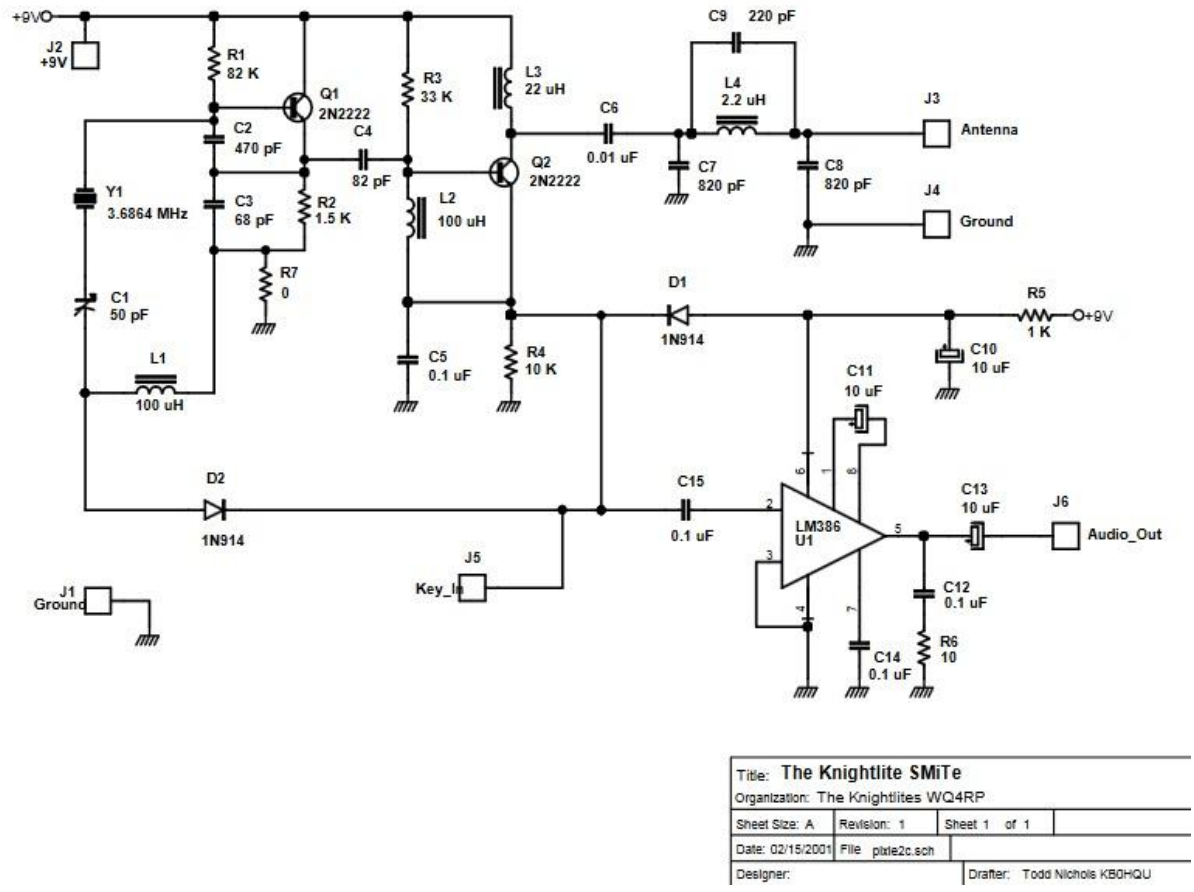


Below is the Pixie of W1FB, equipped with an audio filter with 741 operational circuit (and RX – TX shift circuit management).



KNIGHT SMITE:

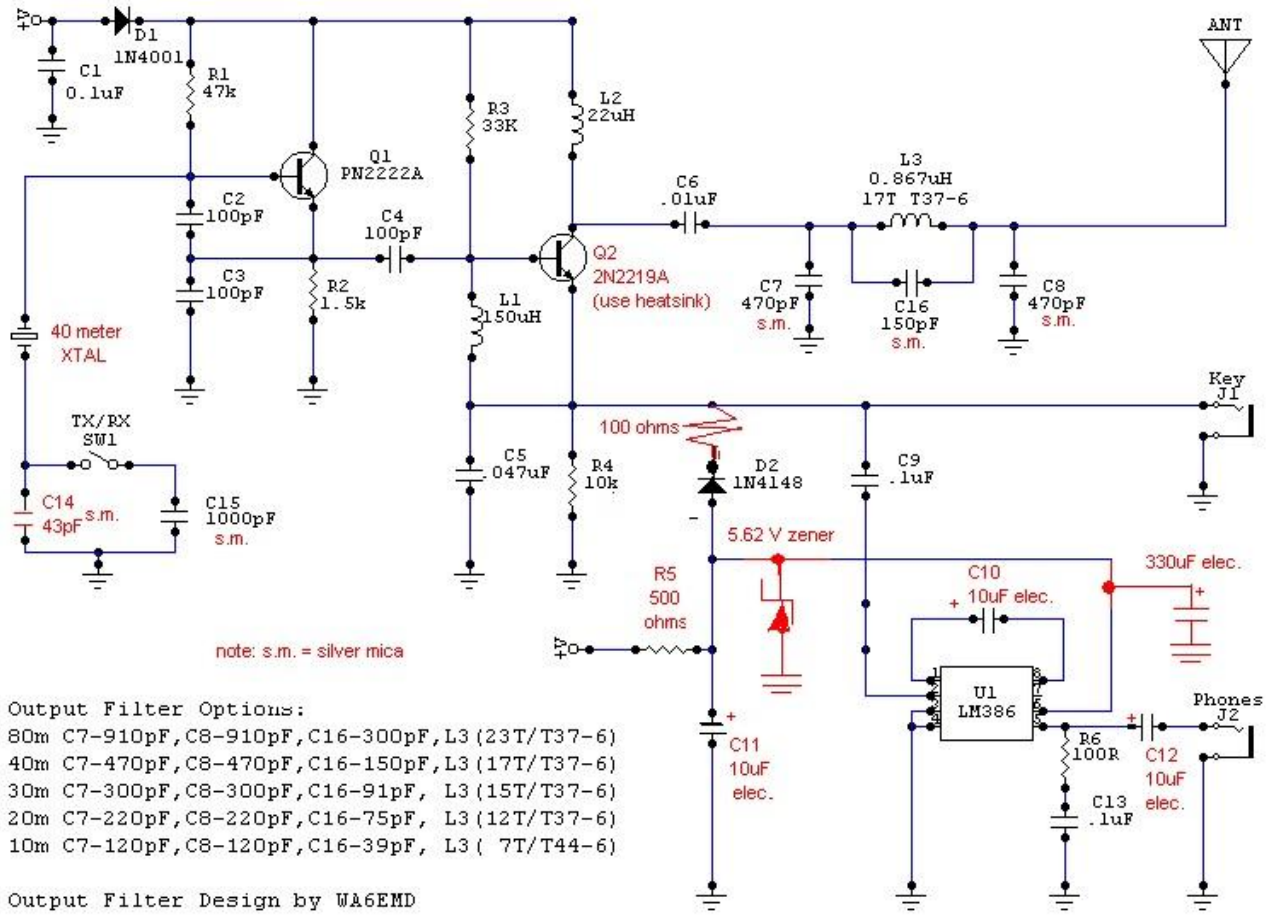
It is an SMT version of the Pixie2, produced for 80 meters. The kit is "sold out", but diagrams and PCB layouts are available on the site. It has features such as: VXO, direct conversion, less than watt output power, using the "very powerful" 2N2222 power amplifier.



Title: The Knightlite SMiTe		
Organization: The Knightlites WQ4RP		
Sheet Size: A	Revision: 1	Sheet 1 of 1
Date: 02/15/2001	File pixie2c.sch	
Designer:	Drafter: Todd Nichols KB0HQU	

TINY TORNADO

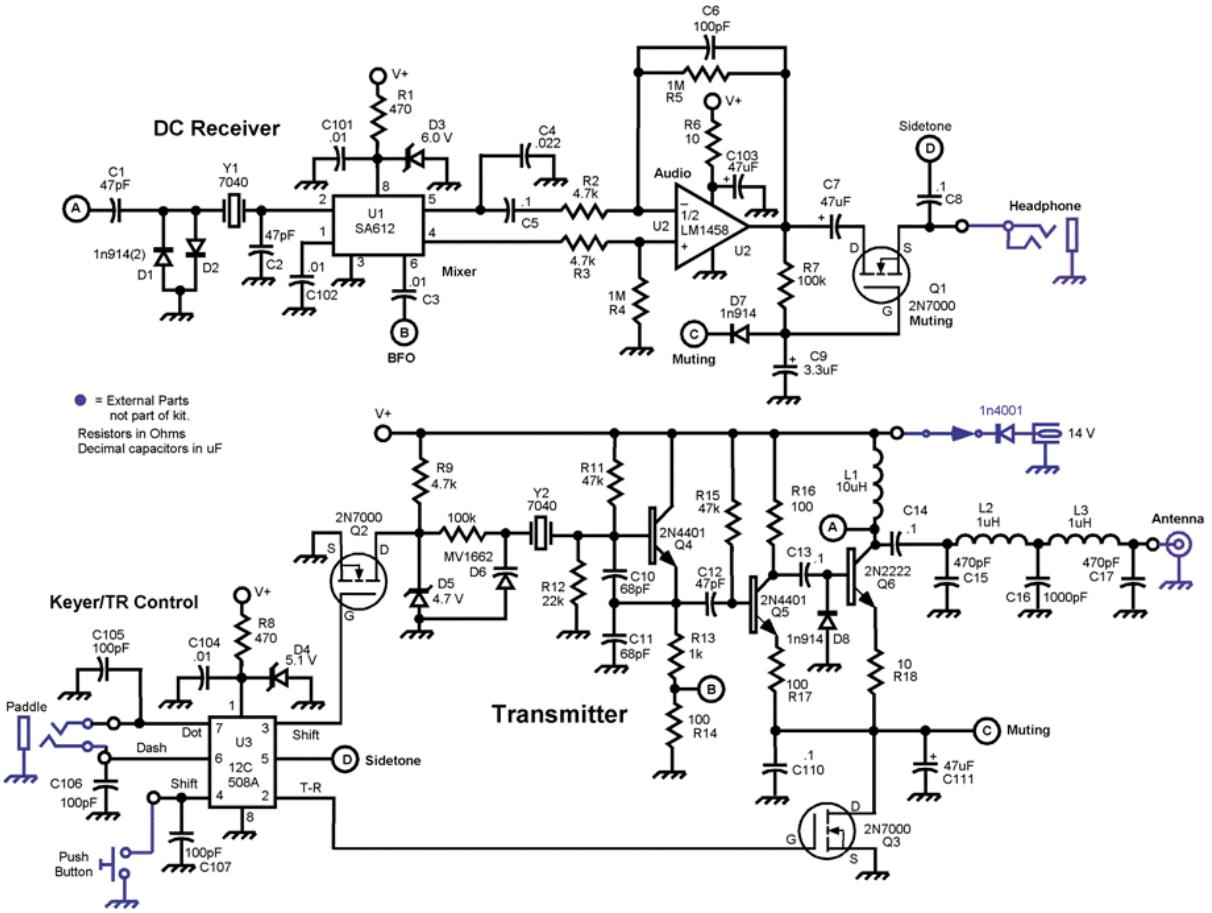
Developed by K8MAV, in the wake of Pixie2, it is very similar, with some improvements (e.g. it features manual frequency switching between TX and RX, or rather switches between two very close frequencies). It presents calculations for low pass output filters for 80, 40, 30, 20, 10 meters. Direct conversion scheme, about 1 watt of power, but generally less, no front end bandpass filters.

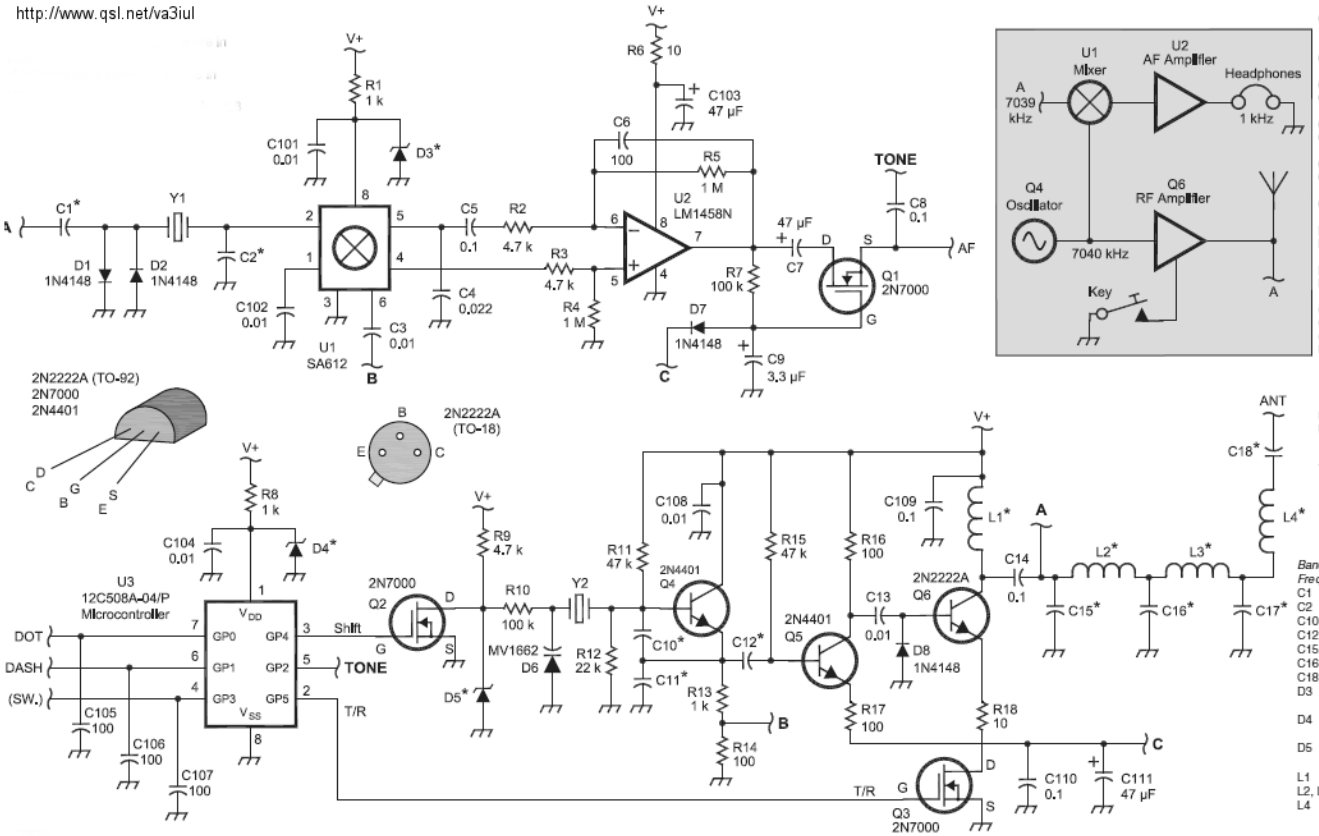


ROCK MITE

RTX designed by K1SWL, is a single quartz RTX, with two very close frequencies (RX and TX) that can be exchanged, 0.5 watts of power, sidetone, automatic frequency shift in transmission, built-in and adjustable keyer, front end filter with a quartz of the same frequency as that of reception and transmission, generally for 80, 40, 30 and 20 m. Hundreds of connections have been made with 0.5 watts: of 1000, 2000, 3000 km and even more (see N5ESE, N5FC and many others). Very few components and a deadly optimization to obtain in a small card of 5 cm x 6 cm all these features ! One of the remaining manufacturers is Kanga Products at this link: RockMite
Warning because other kits available on the web do not have the keyer and quartz filter input.

Here are some Rock Mite schemes:





C1, C2, C10, C11, C12, C18 — NP0 disk capacitor, 5%. See Table 15.3 for values.
C3, C13, C101, C102, C108 — 0.01 µF disk capacitor.
C4 — 0.022 µF monolithic capacitor.
C5, C8, C14, C104, C109, C110 — 0.1 µF monolithic capacitor.
C6, C105-107 — 100 pF disk capacitor.
C7, C103, C111 — 47 µF, 25 V electrolytic capacitor.
C9 — 3.3 µF, 50 V electrolytic capacitor.
C15, C17 — Disk capacitor, 5%. See Table 15.3 for values.
C16 — C0G monolithic capacitor 5%. See Table 15.3 for values.
D1, D2, D7, D8 — 1N4148 diode.
D3, D4, D5 — Zener diode, 0.5 W. See Table 15.3 for values.
D6 — MV1662 varicap diode.
L1, L2, L3, L4 — Molded RF choke, 10% tolerance. See Table 15.3 for values.
Q1, Q2, Q3 — 2N7000 FET.
Q4, Q5 — 2N4401 transistor.
Q6 — 2N2222A transistor.
U1 — SA612AD mixer/oscillator IC. (Surface mount part is used on the kit PC board. If building from scratch, consider the SA612AN in a DIP package.)
U2 — LM1458N dual op-amp IC.
U3 — 12C508A-04/P microcontroller. (Must be programmed before use. See Note 1.)
Y1, Y2 — HC49/U crystal (20 pF load) for operating frequency of interest. Crystals for popular QRP frequencies, including those shown in Table 15.3, are available from expandedspectrumsystems.com or AF4K.com.

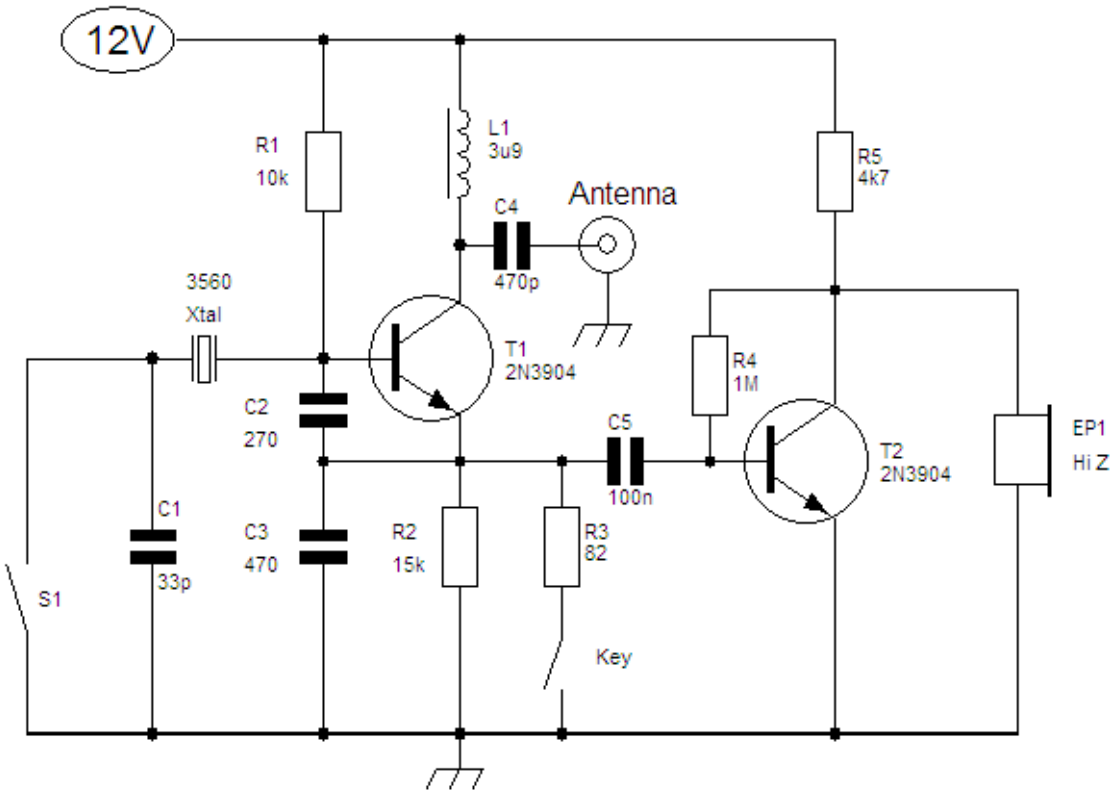
Band	*80 m*	*40 m*	*30 m*	*20 m*
Freq (MHz)	*3.560*	*7.030*	*10.106*	*14.060*
C1	47 pF	47 pF	47 pF	47 pF
C2	33 pF	47 pF	47 pF	47 pF
C10, C11	68 pF	68 pF	33 pF	39 pF
C12	47 pF	47 pF	33 pF	39 pF
C15, C17	560 pF	470 pF	330 pF	220 pF
C16	1200 pF	1000 pF	680 pF	470 pF
C18	330 pF	150 pF	82 pF	82 pF
D3	1N5231B (5.1 V Zener)	1N5231B (5.1 V Zener)	1N5231B (5.1 V Zener)	1N5233B (6.0 V Zener)
D4	1N5231B (5.1 V Zener)	1N5231B (5.1 V Zener)	1N5231B (5.1 V Zener)	1N5230B (4.7 V Zener)
D5	Omitted	1N5236B (7.5 V Zener)	1N5231B (5.1 V Zener)	1N5230B (4.7 V Zener)
L1	15 µH	10 µH	6.8 µH	4.7 µH
L2, L3	2.2 µH	1 µH	0.68 µH	0.47 µH
L4	5.6 µH	3.3 µH	3.3 µH	1.5 µH

1 WATTER

The "1 Watter" is a QRPp kit with VXO available for the 160, 80, 40, 30, 20, 17 and 10 meter bands. The name comes from the output power, 1 watt, in CW. It costs $47 and can be found at**: http://kitsandparts.com** .

It's a monoband, double conversion kit. The tunable frequency band is about 5-7 kHz for 160, 80, 20, 15 meters; about 18-19 kHz for 40, 30, 17 meters and about 9 kHz for 10 meters. For selectivity three-stage quartz filter dipsone (feature not present in many other minimalist circuits), and has integrated keyer, sidetone and shift in automatic listening. Also includes skipping SMT components. The features are absolutely good for the cost.

80 m CW Transceiver XBM80-2



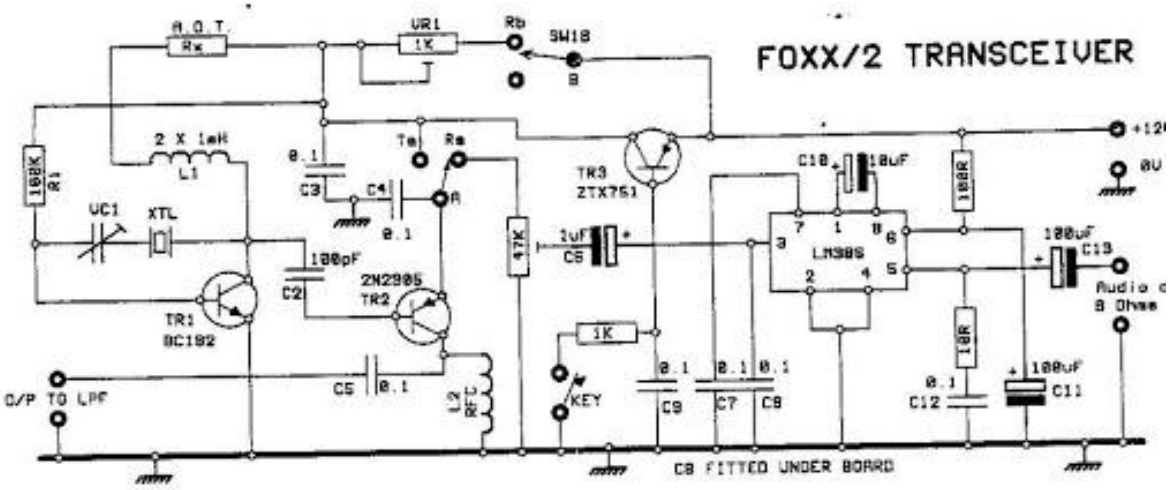
Experimental 80m CW Transceiver XBM80-2 (Rev E)

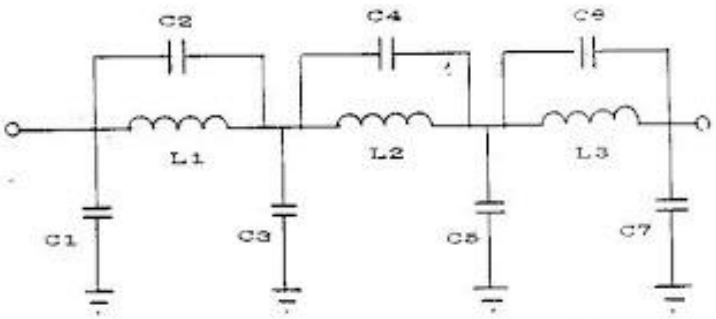
FOXX-2

Product kit in 80, 60, 40, 30 and 20 meters version. It is single frequency, with VXO crystal oscillator, minimal, direct conversion; it has about 1 watt output power, in CW. It has sidetone and listening with automatic shift in RX; listening through the classic LM386, as in Pixie. The link where to go for the kit is the following:
http://www.kanga-products.co.uk/index.php

The diagram is as follows:

Translated with www.DeepL.com/Translator (free version)





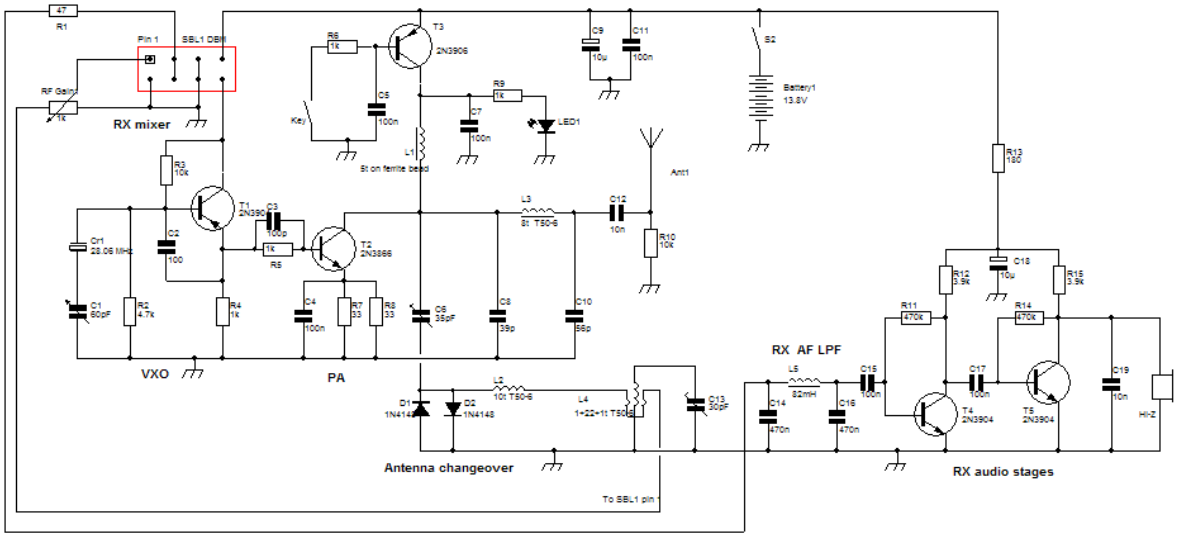
KANGA's 10 POLE FILTER

KANGA PRODUCTS

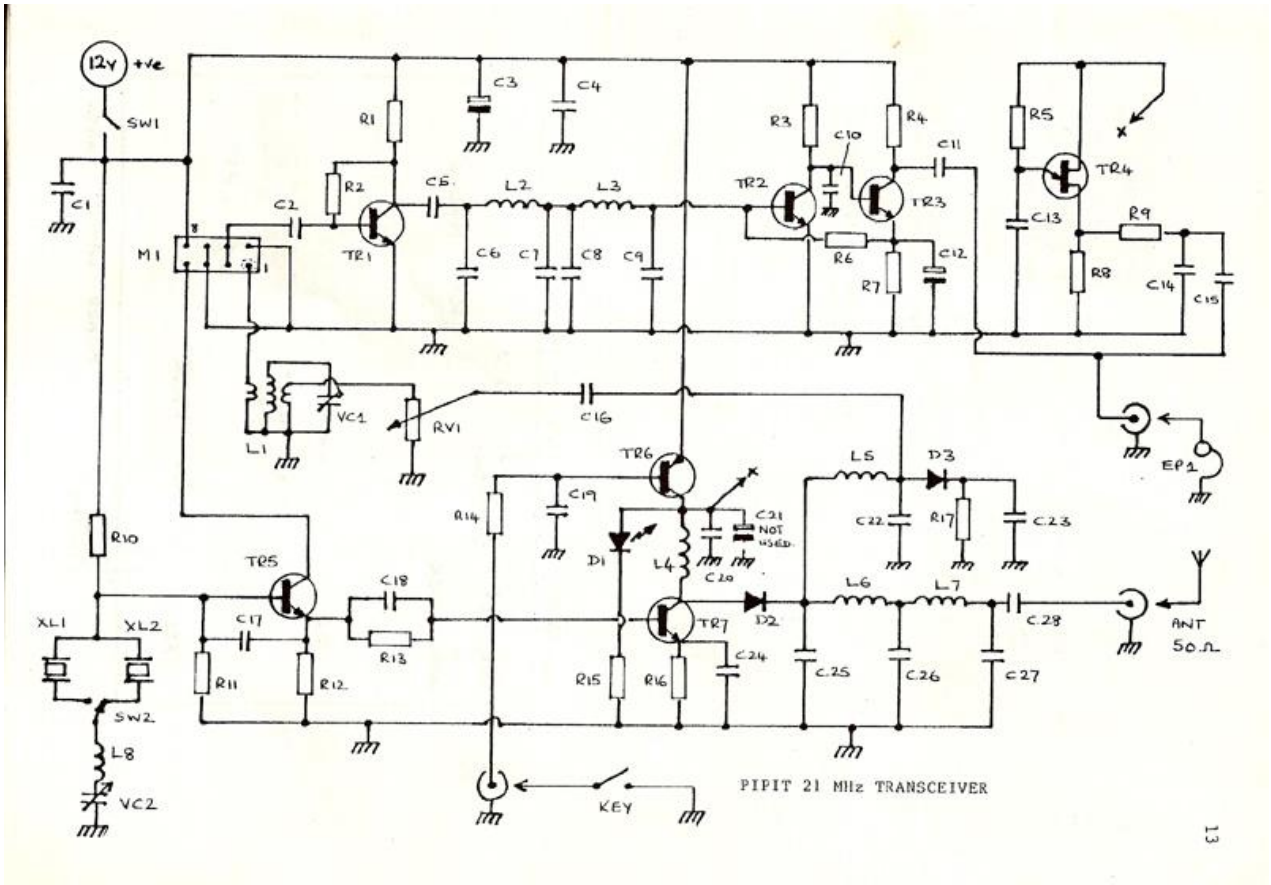
THE TENNER & THE PIPIT

They are two QRPp minimalist transceivers developed using the OXO described above, and the SBL 1 mixer, with a direct conversion receiver. The Tenner is designed for the 10 meter band, the Pipit is designed for the 15 meter band.

Here is the link to The Tenner and The Pipit , by G3XBM.Here is the Tenner (10 meters transceiver):



Here is the Pipit (15 meters transceiver):


12V +ve
SW1
C1
C2
C3
C4
R1
R2
TR1
C5
L2
L3
C6
C7
C8
C9
M1
R3
R4
C10
C11
TR2
TR3
R6
R7
C12
R5
TR4
C13
R9
R8
C14
C15
VC1
L1
RV1
C16
EP1
TR6
C19
R14
D1
L4
C21
NOT USED
C20
L5
D3
C22
R17
C23
R10
TR5
C18
C17
R13
R11
R12
XL1
XL2
SW2
L8
VC2
L6
L7
C28
ANT
50Ω
D2
TR7
C24
R15
R16
C25
C26
C27
KEY
PIPIT 21 MHz TRANSCEIVER
13

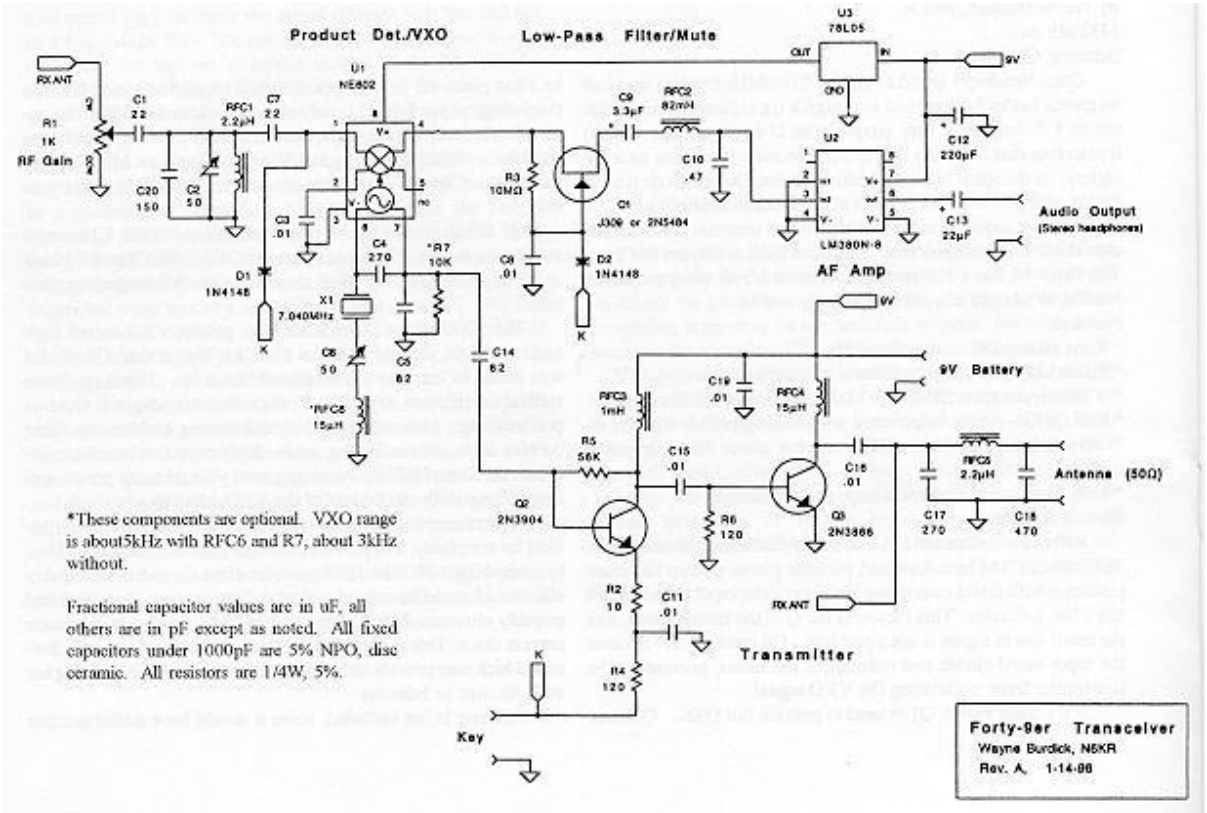
THE 49’ER

Find the references on:

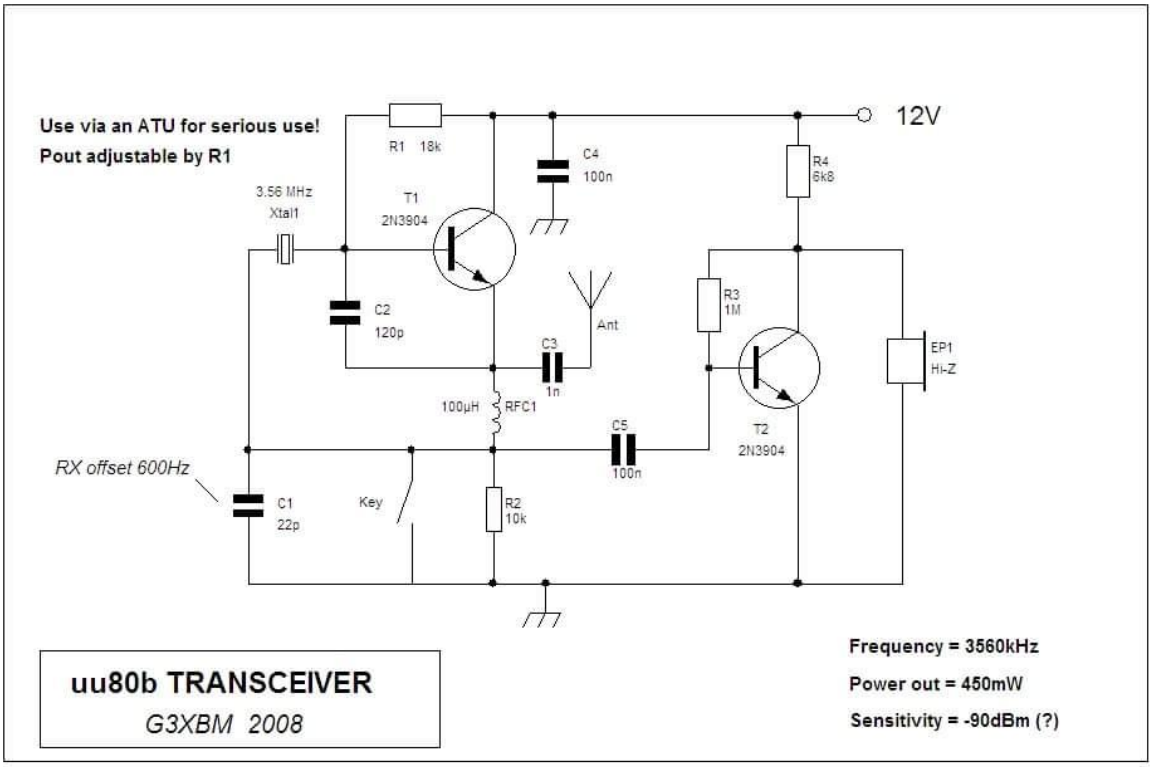
http://www.norcalqrp.org/files/49er.pdf

Unfortunately the kit is no longer available, by the will of the author, N6KR, who holds the copyrigth. So no one can reproduce it for commercial purposes. However, personal construction is possible. In fact, the author thinks that, with the advent of the "38 special" and the SST, there are better circuits to apply to.
The diagram shows a transmitter with VXO tuning, with quartz for the 40 meters (as usual you move a few kHz). The final transistor provides about 1 watt of power, and is a 2N3866.
As a receiver it uses the NE602 Mixer (18 dB gain), with a parallel LC bandpass filter in front (i.e. not as narrow band as a quartz or ladder filter). The integrated audio is the classic LM380N. There is no sidetone, nor automatic frequency shift in transmission.

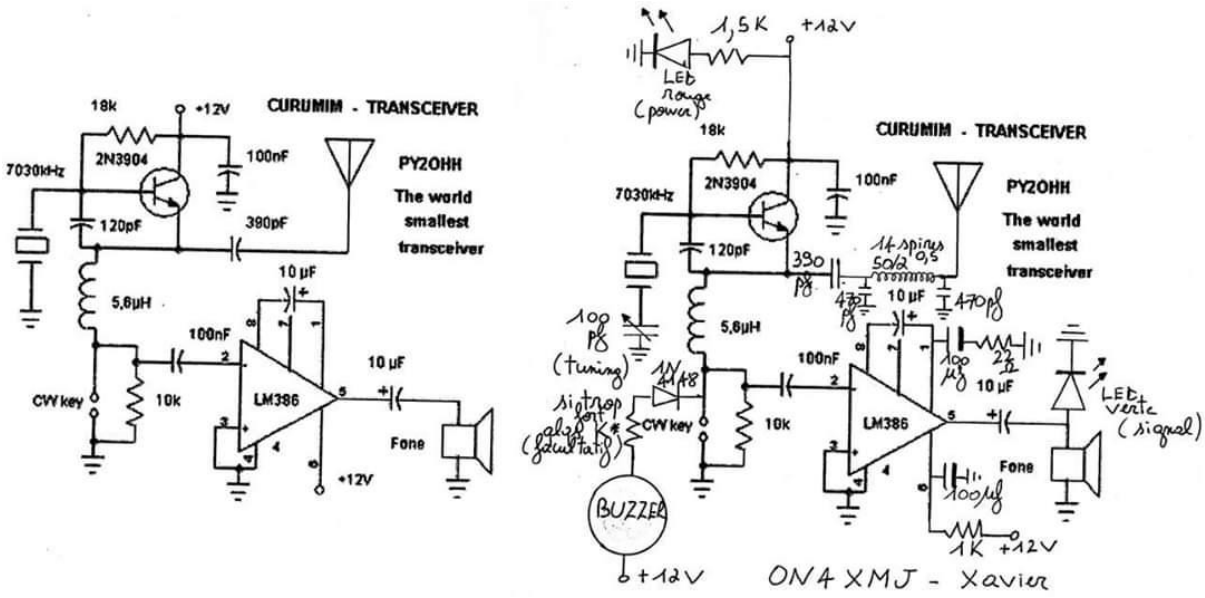
Here is the schema of the transceiver, by N5XR.


Product Det./VXO
Low-Pass Filter/Mute
AF Amp
9V Battery
Audio Output
(Stereo headphones)
Antenna (50Ω)
Transmitter
Key
RX ANT
RF Gain
LM380N-8
*These components are optional. VXO range is about5kHz with RFC6 and R7, about 3kHz without.
Fractional capacitor values are in uF, all others are in pF except as noted. All fixed capacitors under 1000pF are 5% NPO, disc ceramic. All resistors are 1/4W, 5%.
Forty-9er Transceiver
Wayne Burdick, N6KR
Rev. A, 1-14-96

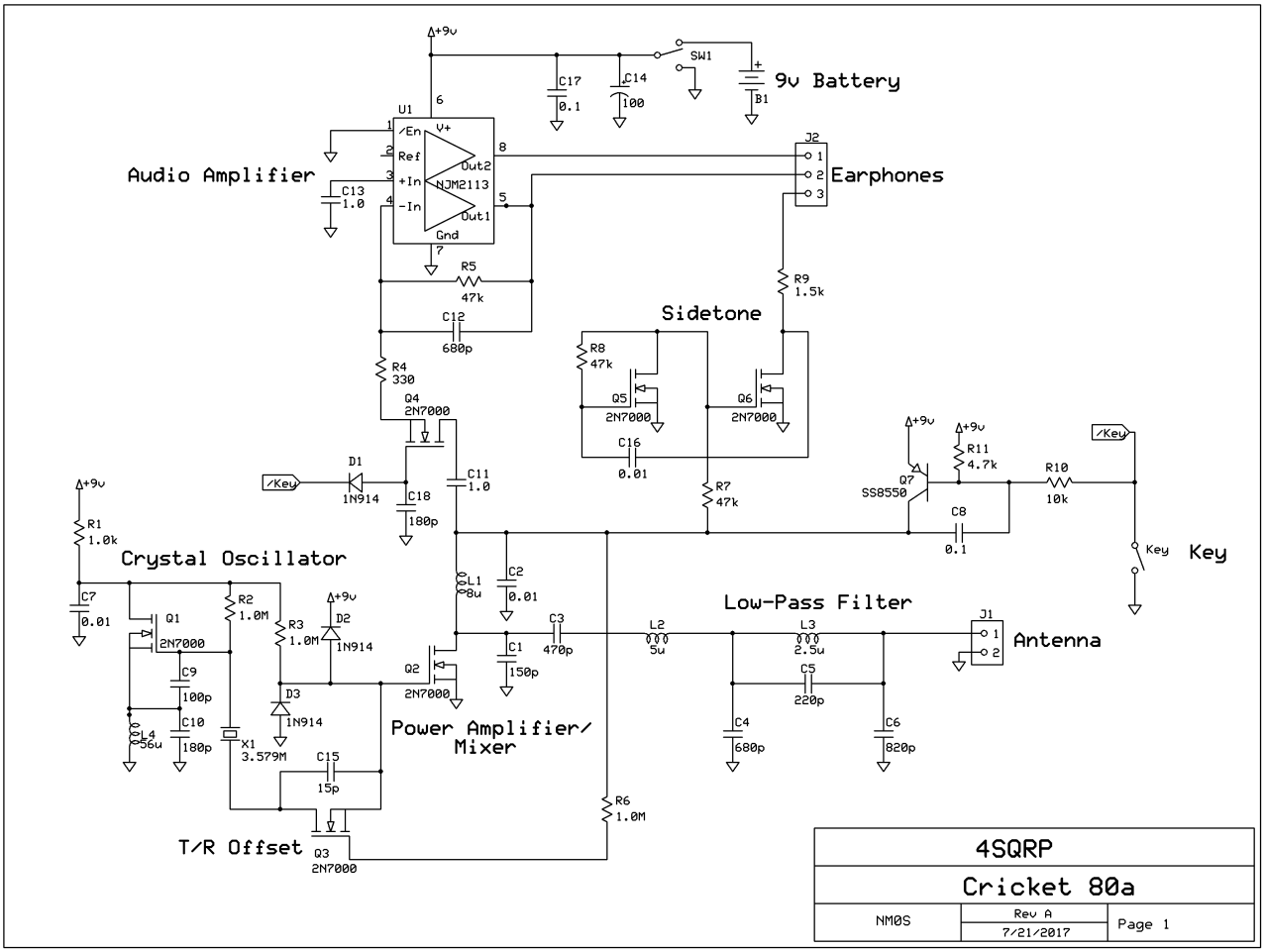
Uu80b Transceiver by G3XBM



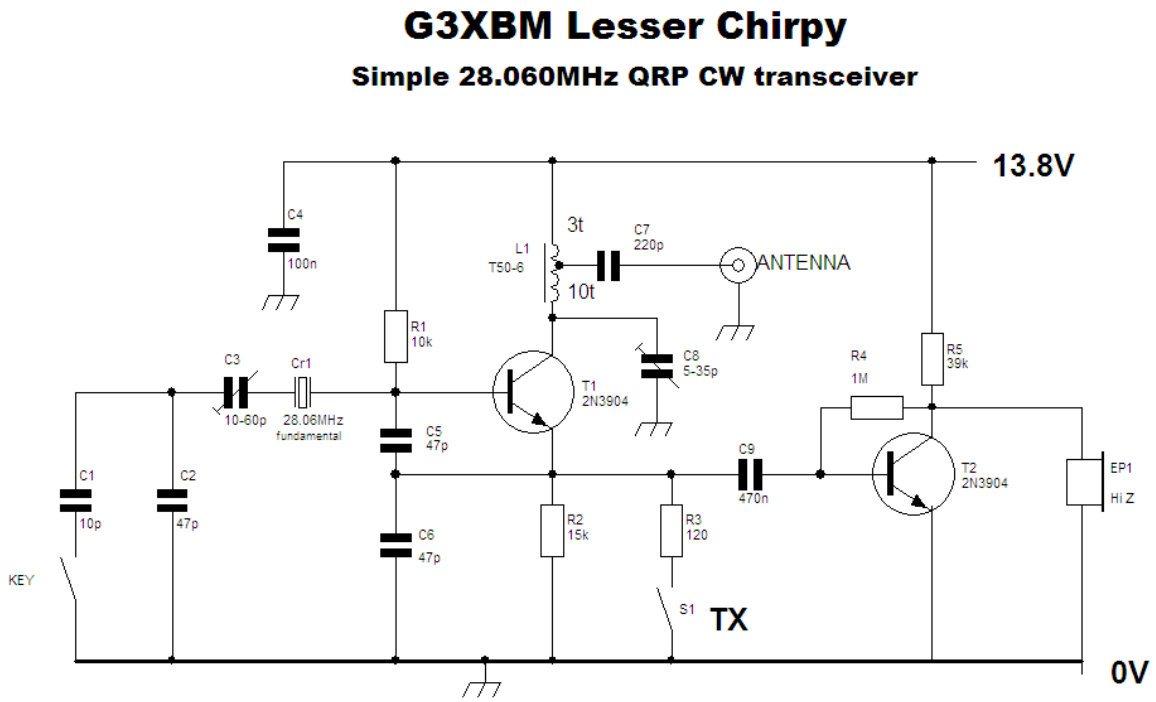
Curumin by PY2OHH and modification by ON4XMJ



4SQRP Cricket 80a



The 10 m Lesser Chirpy

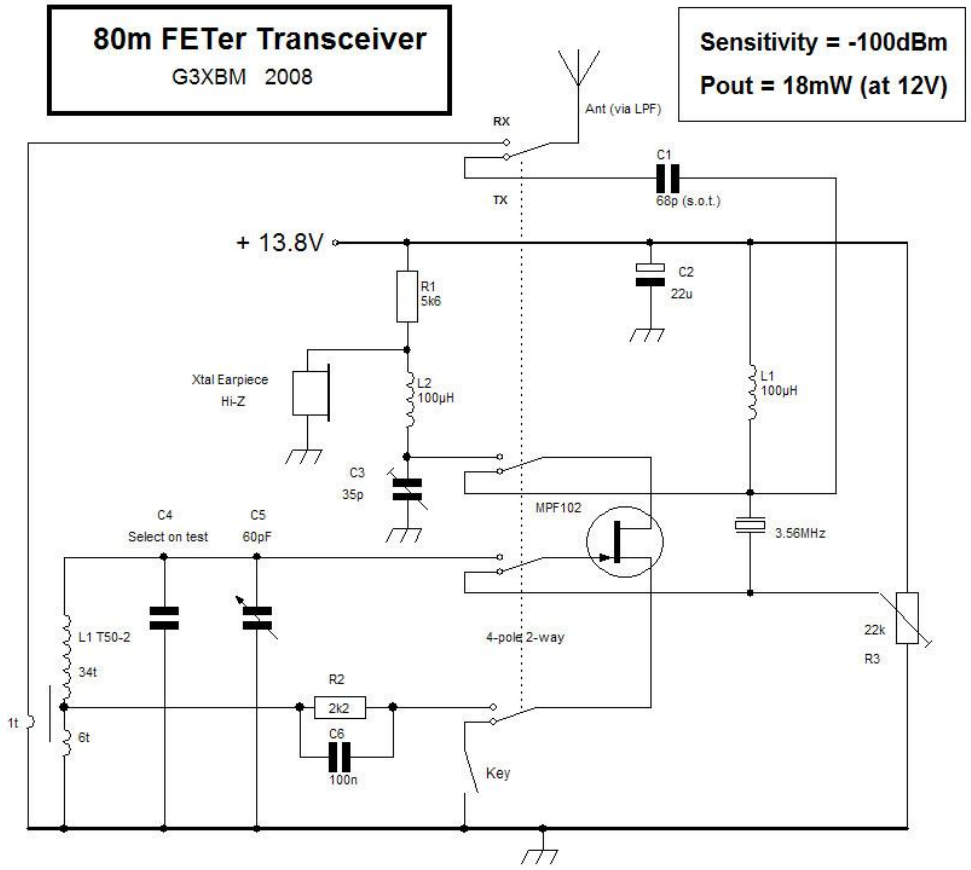


Rev B - July 29th 2012

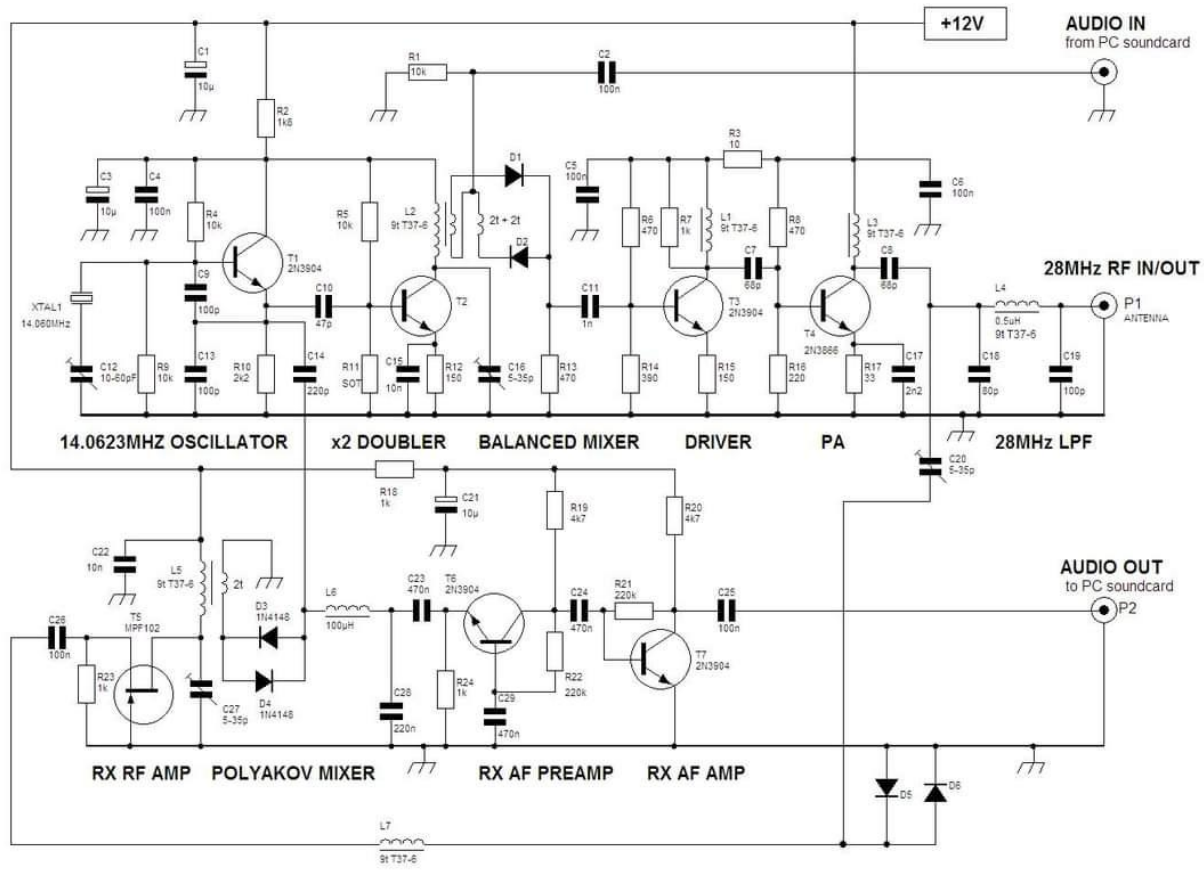
Circuit error corrected

~150mW RF out - negligible chirp!
-100dBm sensitivity
Correct RX/TX offset frequency

FET Transceiver 80 m by G3XBM



Wispy-10 WSPR RTX



"WISPY-10" 28MHz WSPR transceiver

DSB 200mW pep Uses low cost GQRP 14.060MHz crystal (pulled)

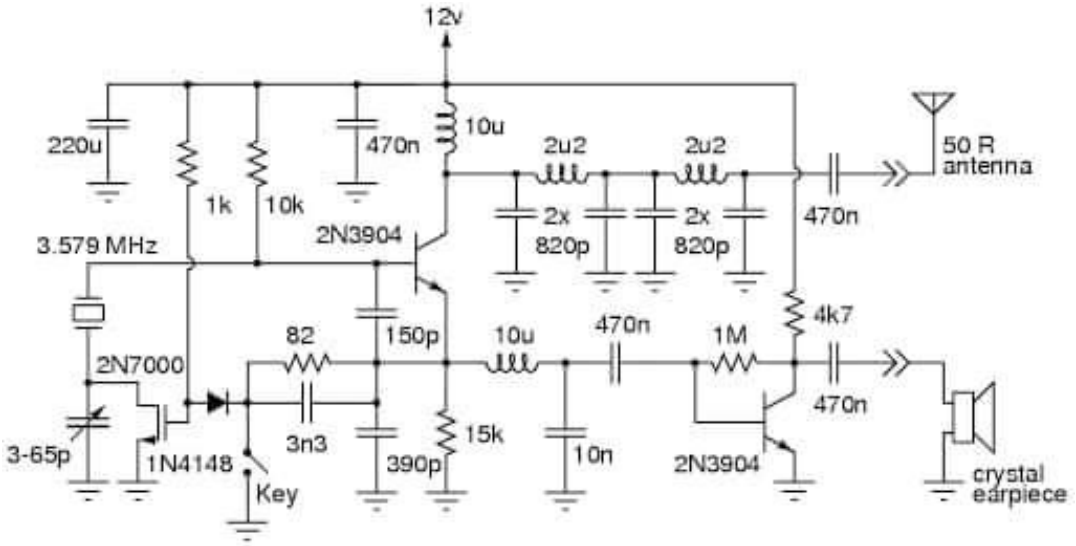
Rev B 10.9.12 Copyright G3XBM

Notes:

C20 and L7 form BPF on RX
On TX D5/6 conduct shorting C20 to ground
D3/4 are part of a half freq injection polyakov mixer
Drive to PA to be adjusted to keep clean o/p signal
TX and RX have been separately breadboarded and tested
Adjust R11 for best 2nd harmonic output at L2

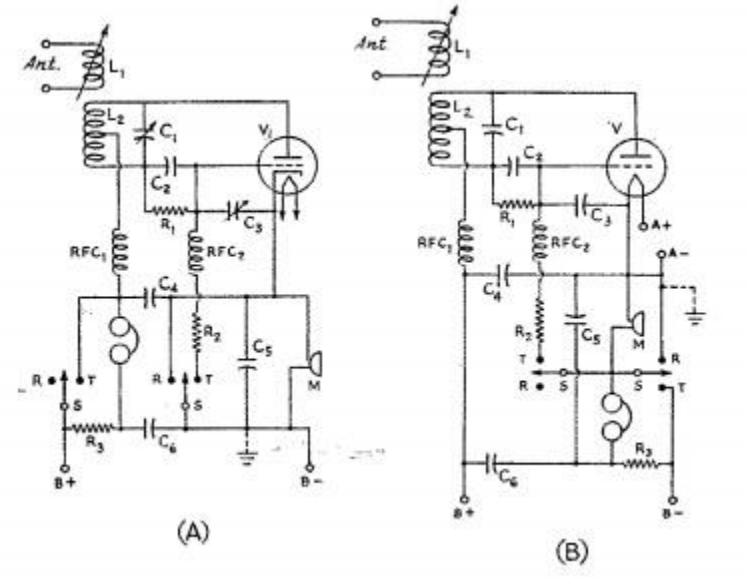
DRAFT - there may be further changes (and errors on schematic!)

VK2ZAY version of XBM80-2

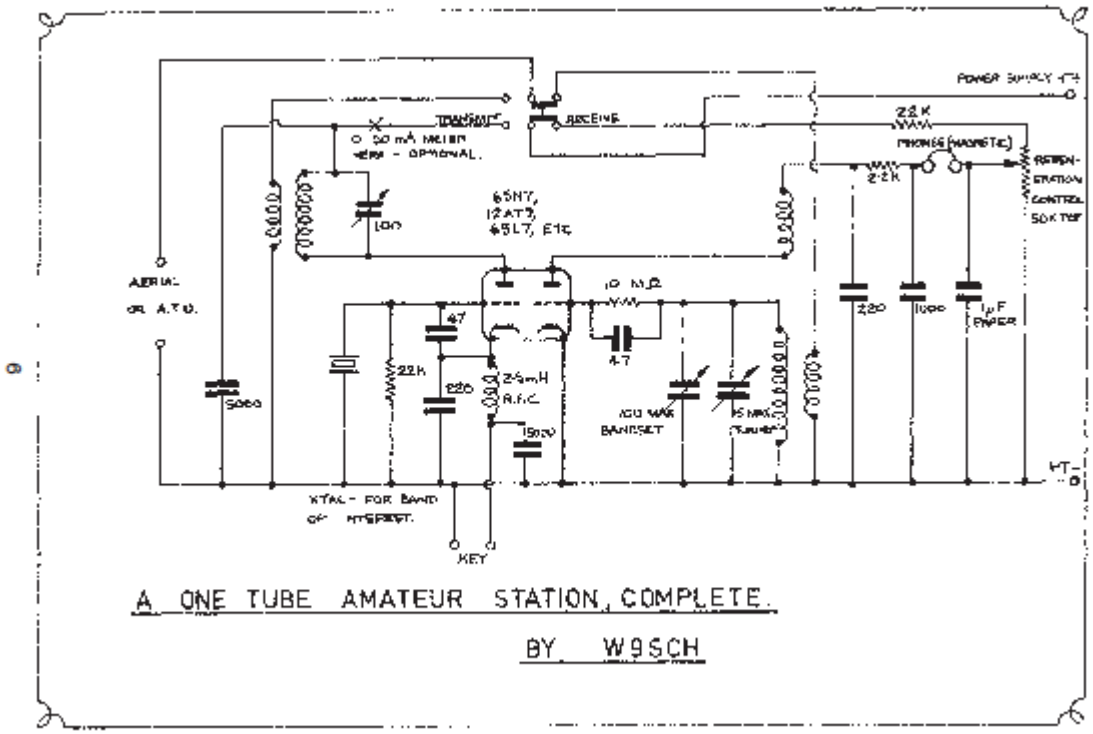


VK2ZAY's version of the XBM80-2 by G3XBM

1944 one tube TRX



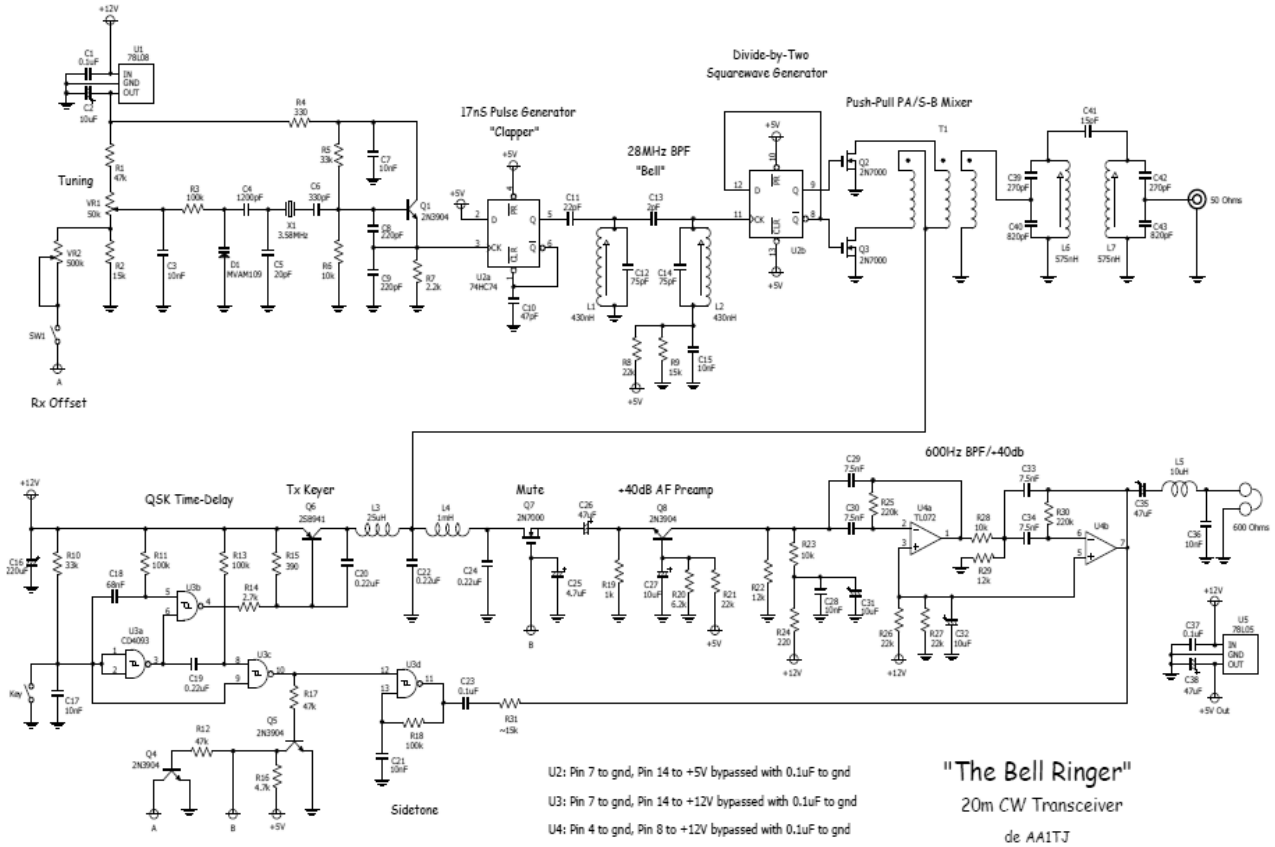
One tube amateur station, by W9SCH



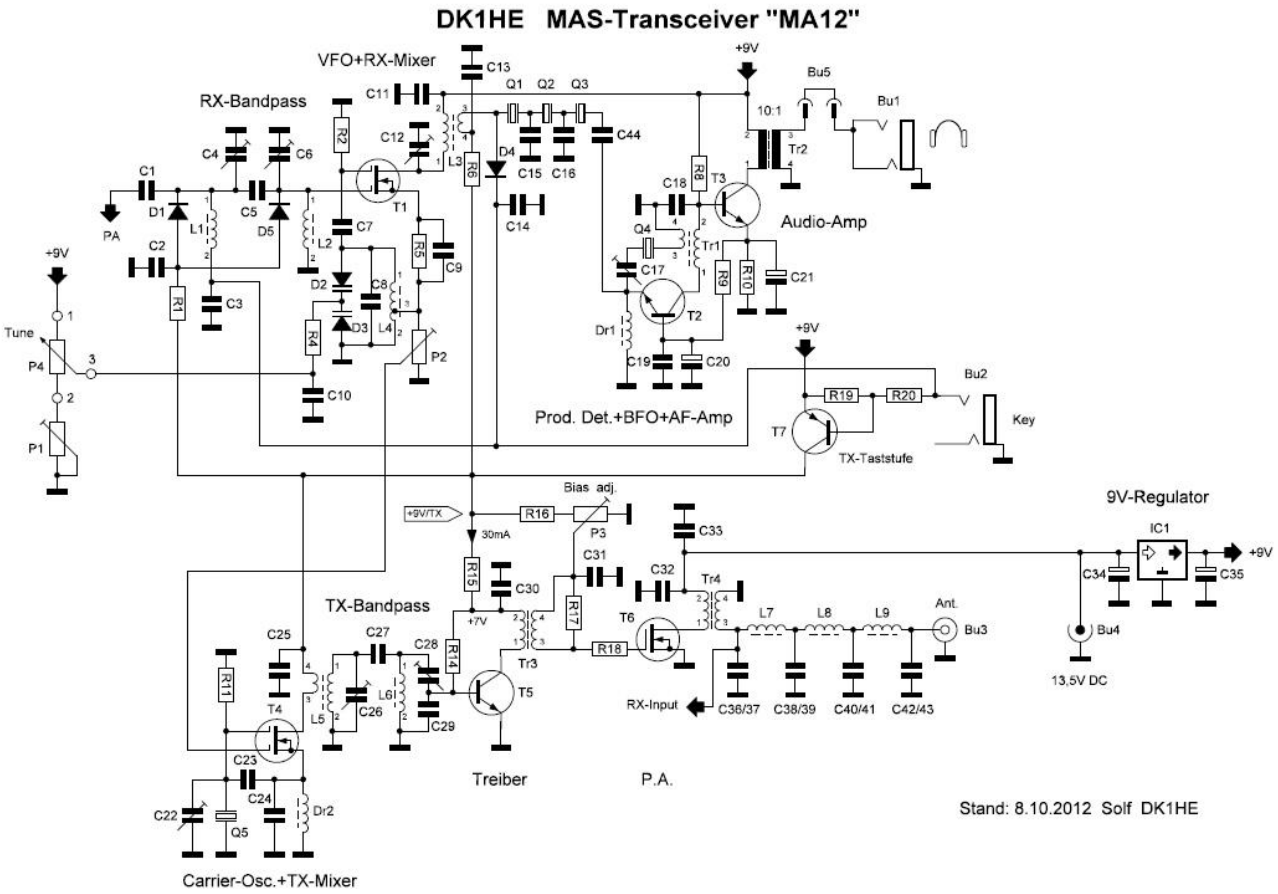
A ONE TUBE AMATEUR STATION, COMPLETE.

BY W9SCH

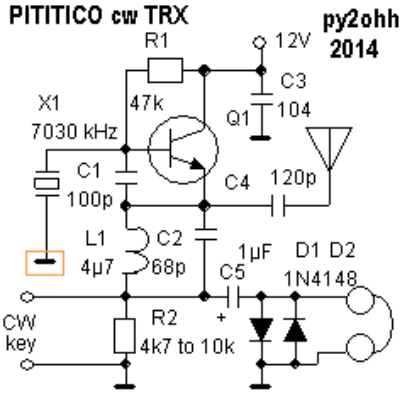
The Bell Ringer, 20 m RTX by AA1TJ



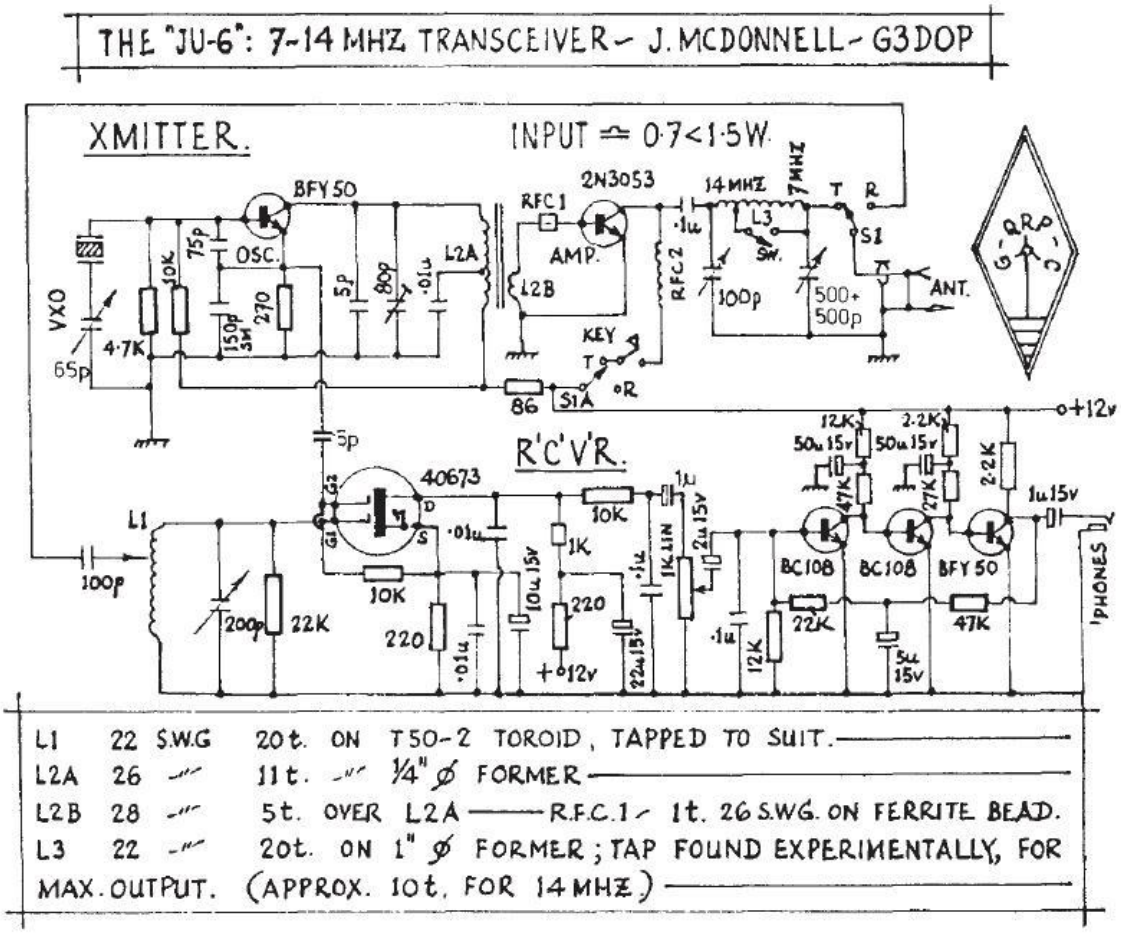
The MAS-Transceiver by DK1HE



The Pititico

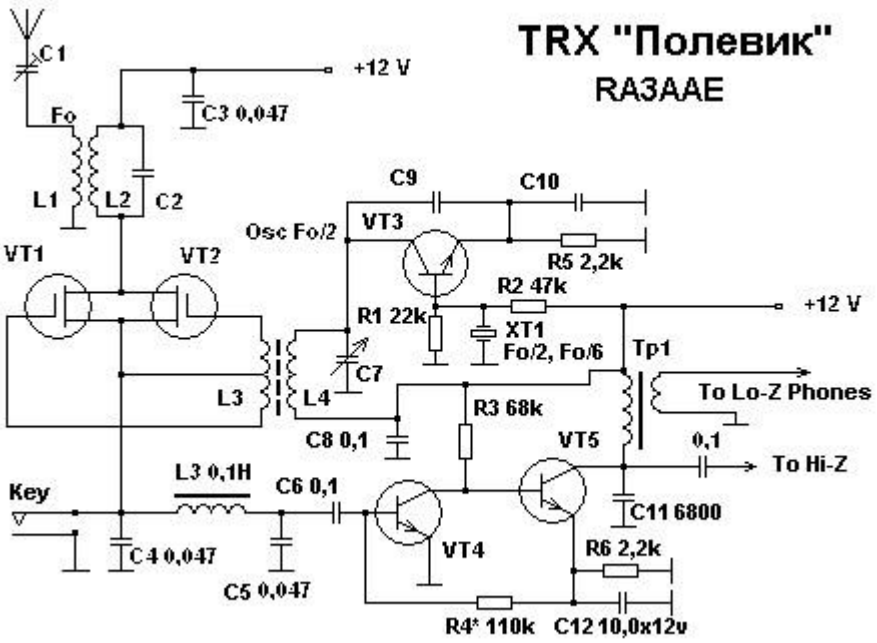


The JU-6 7-14 MHz Transceiver by G3DOP

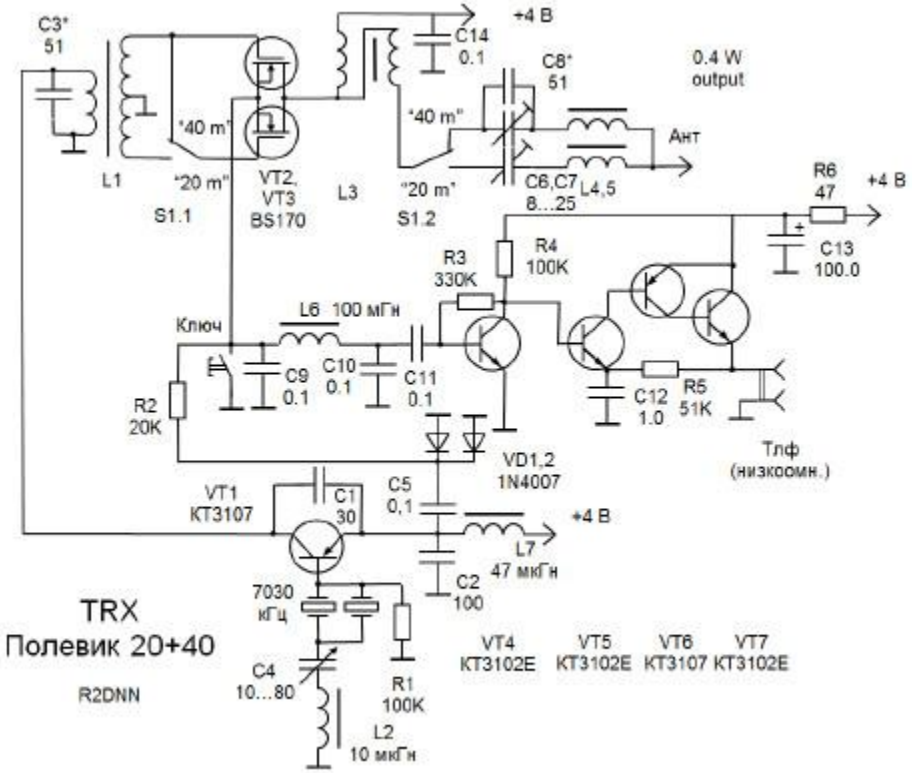


This little rig was evolved from various sources (particularly the Wes Hayward 'Mini' transceivers) and built from junk box parts. On 7MHz the VXO gives a swing of 3-4 KHz and 14 MHz crystals swing about 7 KHz. One can use a 7MHz crystal for 14 MHz operation with some loss in output and RX gain, but always use an antenna tuning unit if this is done. The RX is excellent and the gain usually has to be turned down on DX signals. With a low, much bent LW antenna 30 countries have been worked so far, including W and VE. Those who are worried about the 40673 being damaged during transmit periods can modify S1 to break the RX 12V line when transmitting, although the circuit as shown in Fig 1 has given no trouble in this respect.

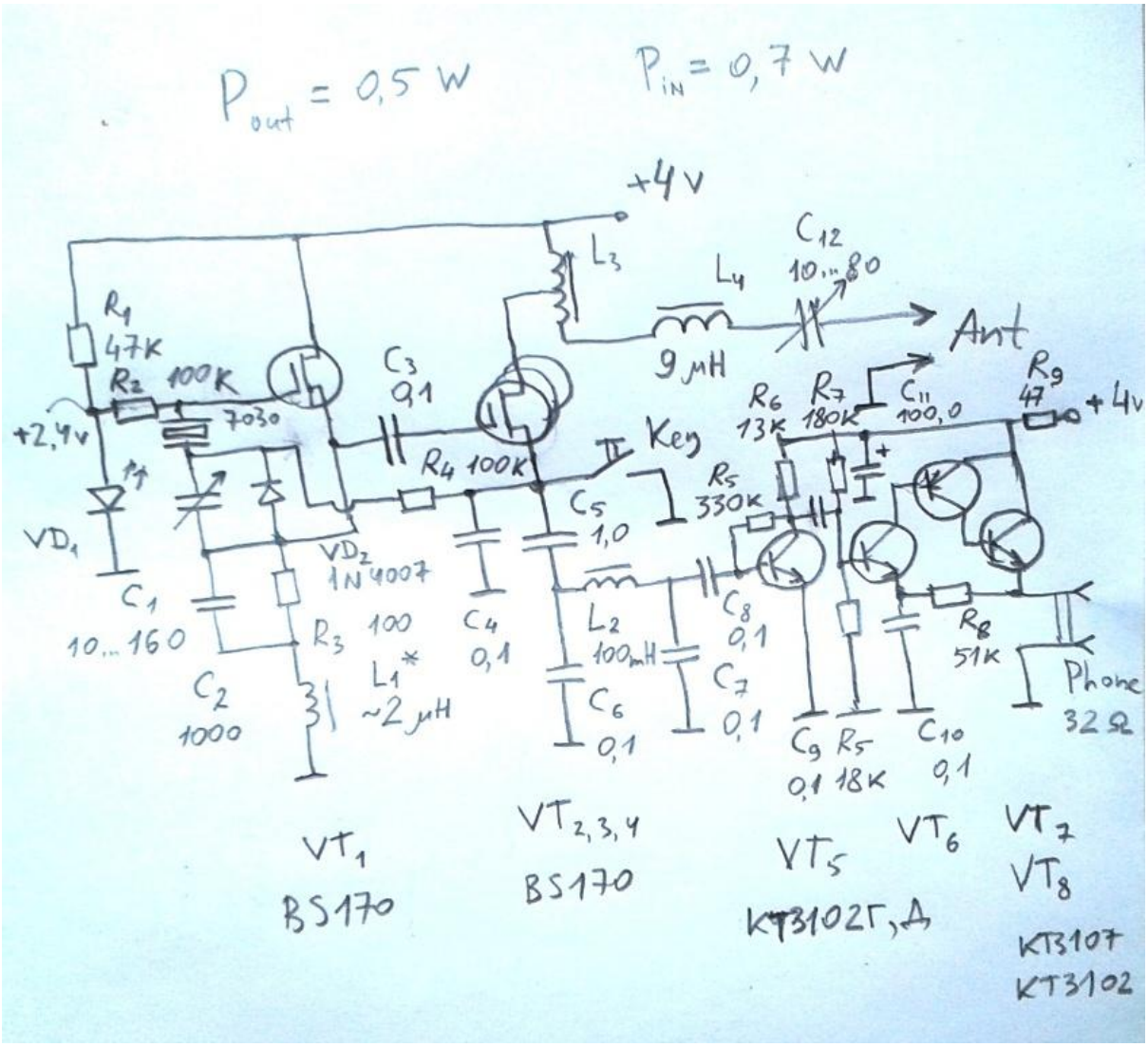
RTX Polevik by RA3AAE



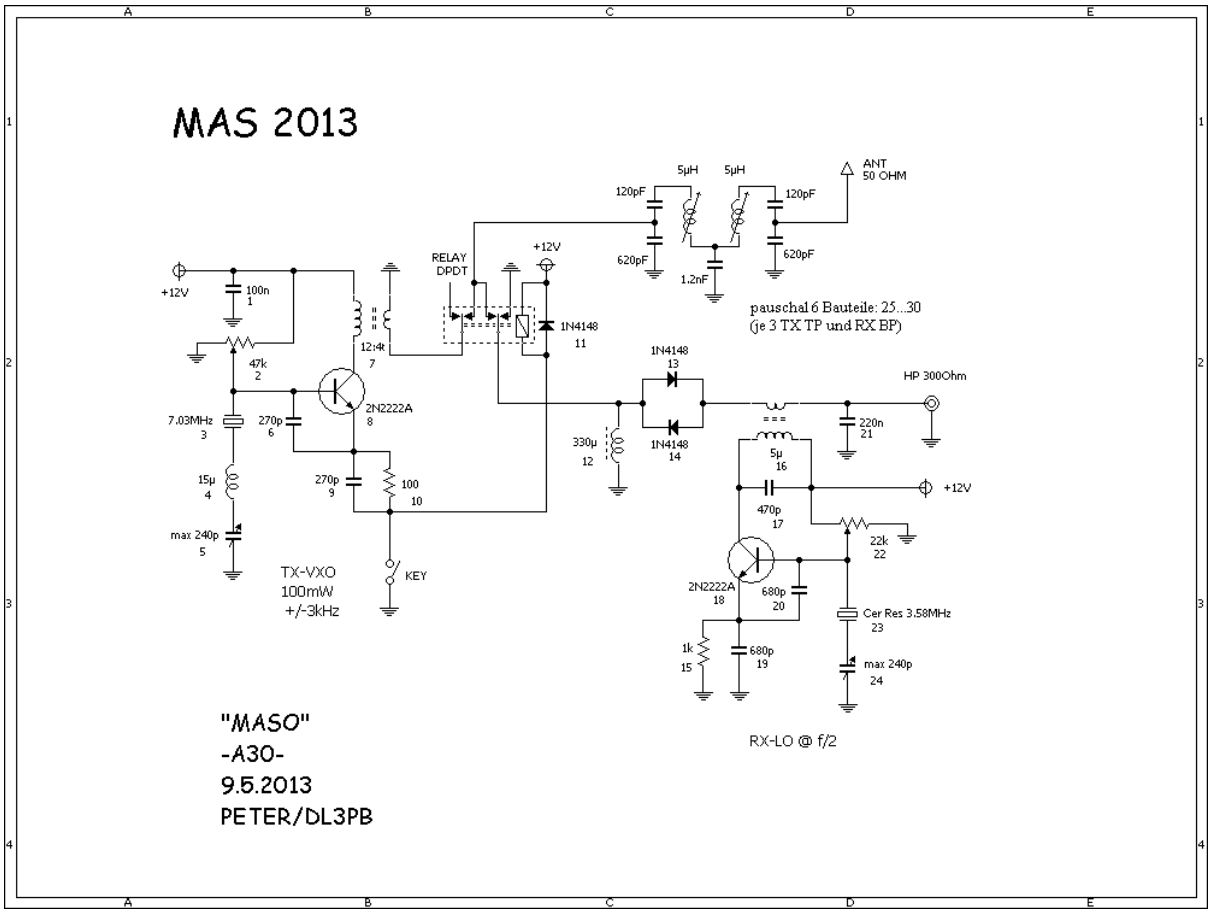
RTX Polevik 20 + 40 by R2DNN



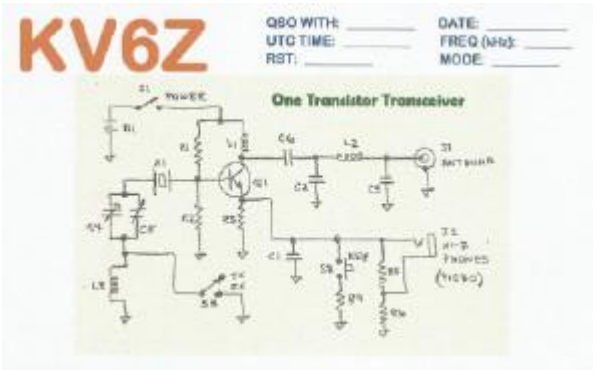
TRX 40 m by R2DNN



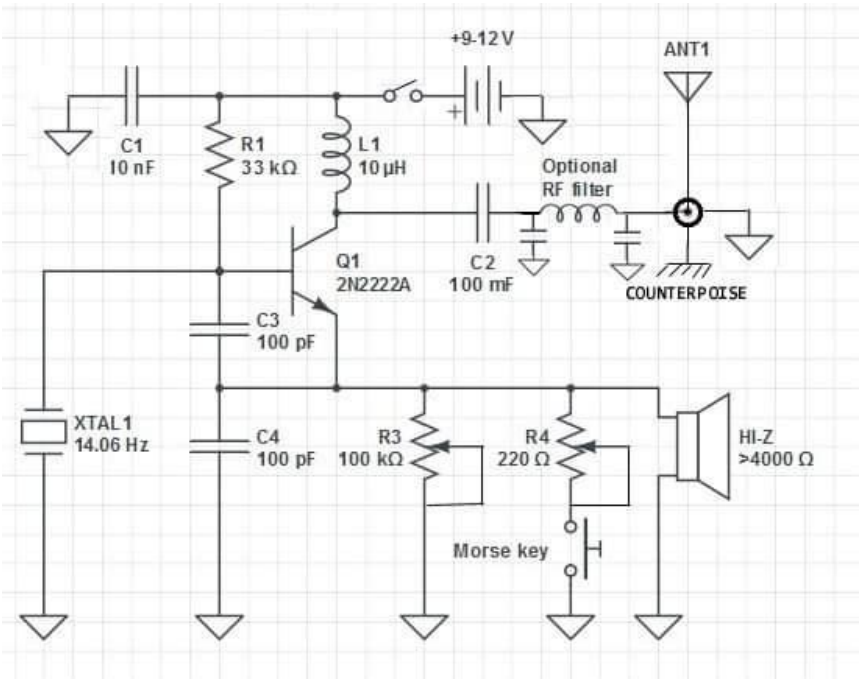
MAS 2013



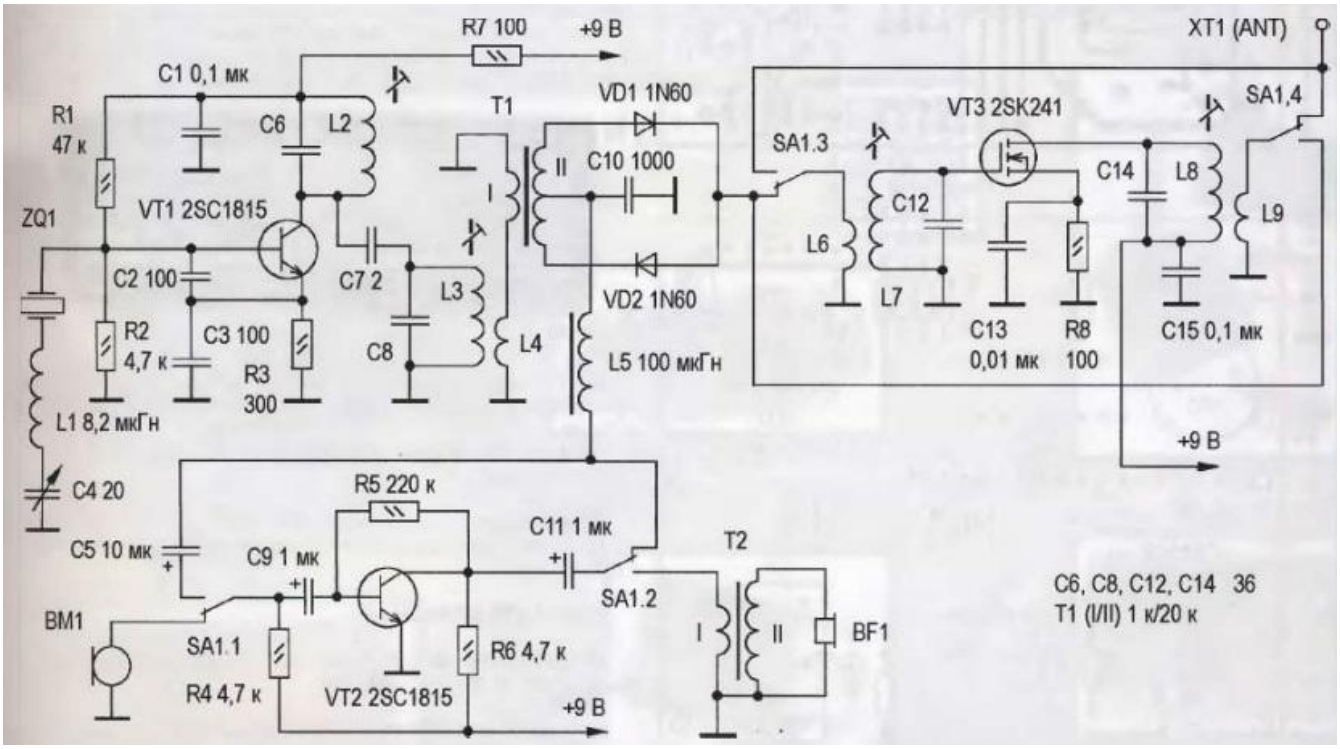
One transistor transceiver by KV6Z



HA4OO Transceiver



DSB microtransceiver



DSB microtransceiver 21 MHz

DSB МИНИТРАНСИВЕР ПРЯМОГО ПРЕОБРАЗОВАНИЯ

QRP минитрансивер прямого преобразования (рис.1) предназначен для работы в режиме двухполосной модуляции с подавленной несущей (DSB) на фиксированной частоте 21290 кГц. Его можно использовать и в местной любительской радиосети, и в качестве портативной радиостанции при работе в полевых условиях, и как "образцово-показательную" конструкцию "выходного дня". Антенна — телескопическая, длиной 1 м. Рабочая частота определяется частотой кварцевого резонатора, поэтому с минимальными переделками трансивер можно использовать на других любительских диапазонах, установив подходящий резонатор и перестроив на требуемую частоту фильтр L1-L2-C1.

"Сердцем" конструкции является микросхема SA612 — активный балансный преобразователь частоты, имеющий по 2 равноценных входа и выхода. В режиме приема сигнал с антенны через контакты переключателя PTT (Передача) подается на один из входов (вывод 1 микросхемы SA612) смесительного детектора приемника прямого преобразования. В схеме кварцевого гетеродина используются только 3 внешних элемента: кварцевый резонатор X_{tal} и конденсаторы C9, C10. С вывода 5 микросхемы продетектированный сигнал через фильтр нижних частот R5-C12, определяющий селективность приемника по соседнему каналу, поступает на вход усилителя низкой частоты — микросхему LM386. К выходу УНЧ можно подключить низкоомные головные телефоны или небольшую динамическую головку.

Для перехода трансивера в режим передачи подвижные контакты переключателя PTT переводятся в нижнее (по схеме) положение. Сигнал с электретного микрофона усиливается каскадом на транзисторе T1. С выхода этого каскада сигнал подается на вход балансного модулятора — вывод 2 микросхемы SA612. На выходе модуляторе (вывод 4) присутствует DSB сигнал, который поступает на выходной каскад передающего тракта, выполненный на транзисторе T2. Выходная мощность этого каскада — около 100 мВт. Выход усилителя нагружен на фильтр L1-L2-C1, обеспечивающий согласование с короткой штыревой антенной.

Все детали минитрансивера размещены на печатной плате (включая двухпозиционный механический переключатель PTT, который, впрочем, можно заменить на малогабаритное реле с двумя парами переключающих контактов). Топология проводников печатной платы приведена на рис.2. Катушки L1 и L2 — промышленные дроссели. В авторском варианте источником питания минитрансивера служила аккумуляторная батарея напряжением 9 В.

Рис. 1

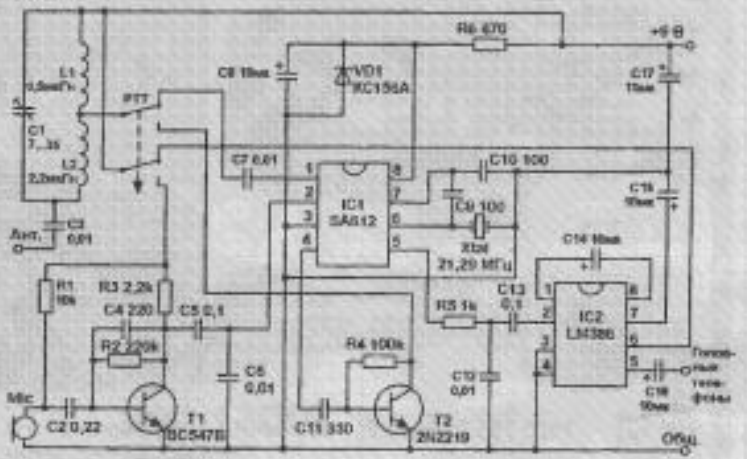
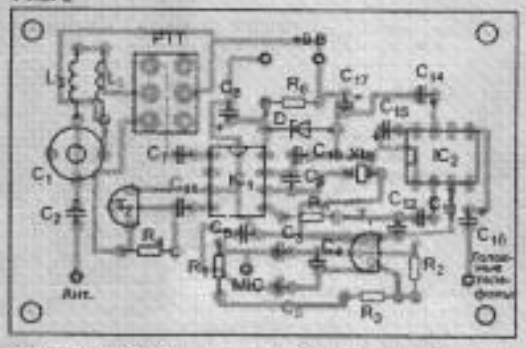


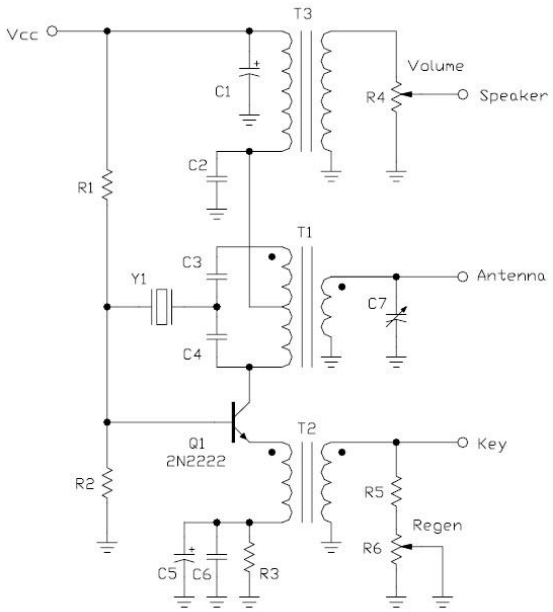
Рис. 2



По материалам статьи "Szinkrodin QRP adó-vevő fóniaüzemre — 21 MHz DSB", опубликованной в журнале "Rádiótechnika", 2006, №8.

The Gnat 40 RTX

One transistor transmitter, and one transistor regenerative receiver!



C1, C5 - 47uF 16WVDC Aluminum Electrolytic
C2, C6 - 0.1uF C7 - 25pF Variable
C3, C4 - See Table 1

Q1 - 2N2222 or 2N4401 (see text)

R1 - 33K R4 - 5K Variable
R2 - 15K R5 - TBD (short)
R3 - 33 ohms R6 - 500 ohm Variable

T1 - 2CT:1 Transformer (see text)
T2 - 1:1 Transformer (see text and Table 1)
T3 - 8 ohm to 1K audio transformer (Xicon 42TL013-RC, available from Mouser, or Radio Shack 273-1380)

Y1 - See Table 1

Frequency	3.5MHz	7.0MHz	10.0MHz
C3	270pF	120pF	82pF
C4	180pF	82pF	56pF
T1	20 turns #30 trifilar wire on T37-6 core	15 turns #30 trifilar wire on T37-6 core	12 turns #30 trifilar wire on T37-6 core
Y1	3.598MHz	7.030MHz	10.130MHz

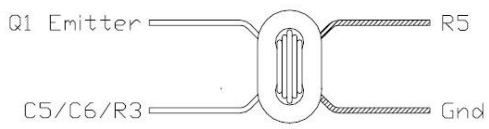
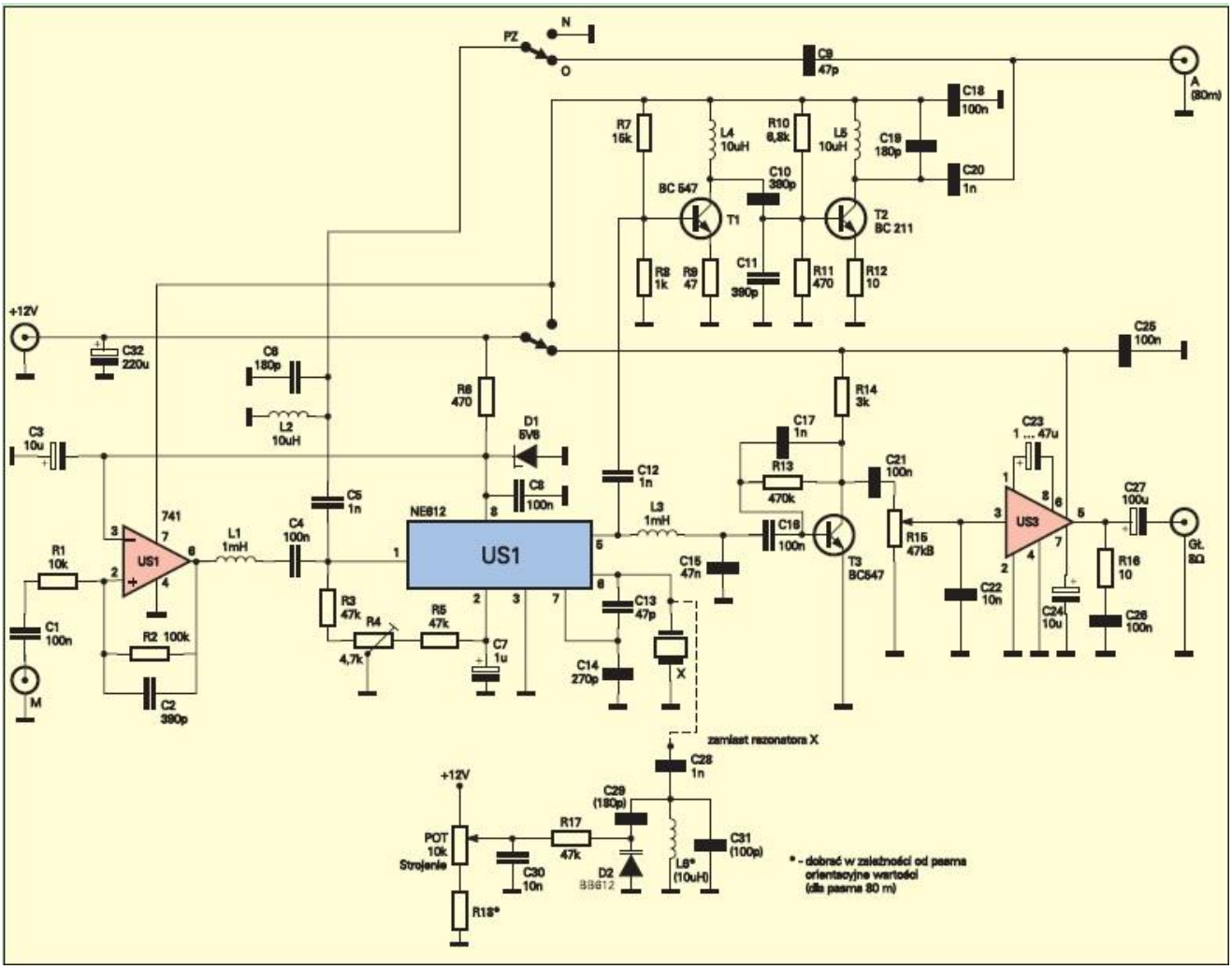


Figure 7 - T2 Construction Details

T2 is a simple 1:1 transformer made with 4 turns of #30 bifilar wire wound on a Fair-Rite 2843002402 binocular core

Polish NE612 DSB Transceiver



R1: 10kΩ
R2: 100kΩ
R3, R5: 47kΩ
R4: 4,7kΩ (potencjometr montażowy)
R6, R11: 470Ω
R7: 15kΩ
R8: 1kΩ
R9: 47Ω
R10: 6,8kΩ
R12, R16: 10Ω
R13: 470kΩ
R14: 3kΩ
R15: 47kΩ/B (potencjometr obrotowy)
R17: 47kΩ
R18: dobrać
POT: 10kΩ (potencjometr obrotowy)

Kondensatory

C1, C4, C8, C16, C18, C21, C25, C26: 100nF
C2, C10, C11: 390pF
C3, C24: 10µF
C5, C12, C17, C20: 1nF
C6, C19: 180pF
C7: 1µF
C9, C13: 47pF
C14: 270pF
C15: 47nF
C22: 10nF
C23*: patrz tekst
C27: 100µF
C32: 220-470µF
C28: 1nF
C29: 180pF
C30: 10nF
C31: 100pF

Półprzewodniki

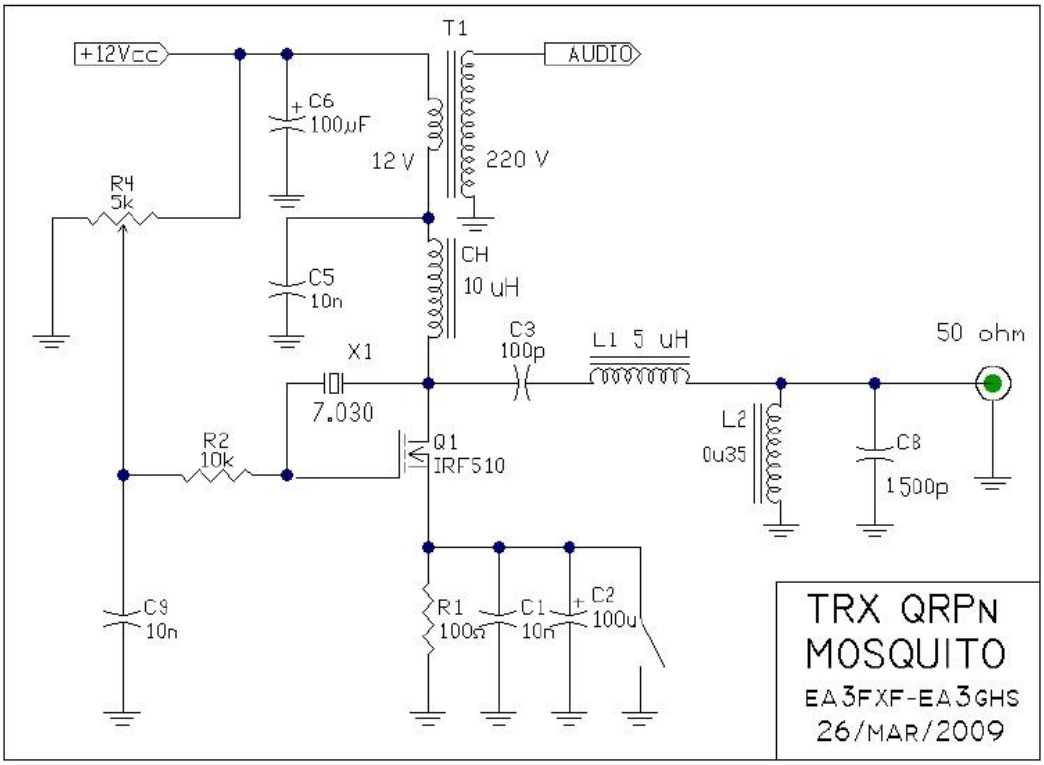
US1: 741
US2: NE612 (602)
US3: LM386
D1: 5V6
D2: BB612
T3, T1: BC547
T2: BC211
Cewki (dławiki w.cz.)
L1, L3: 1mH
L2, L4, L5: 10µH

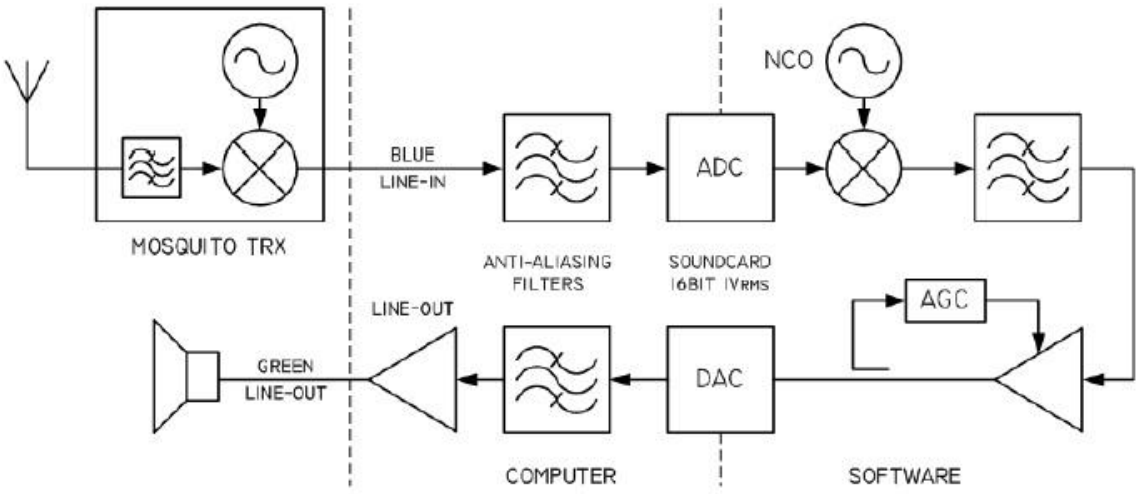
Pozostałe

X: rezonator kwarcowy 3,686MHz (3,65...3,8MHz)
M: mikrofon dynamiczny (wkładka telefoniczna W...)
Gł: głośnik dynamiczny 8 Ω/0,5W
A: gniazdo antenowe typu BNC
Pz: przełącznik lsostat

Uwaga! Elementy: POT, R17, R18, D2, C28...C31 są opcjonalne i nie wchodzą w skład zestawu AVT-2196B

Mosquito TRX

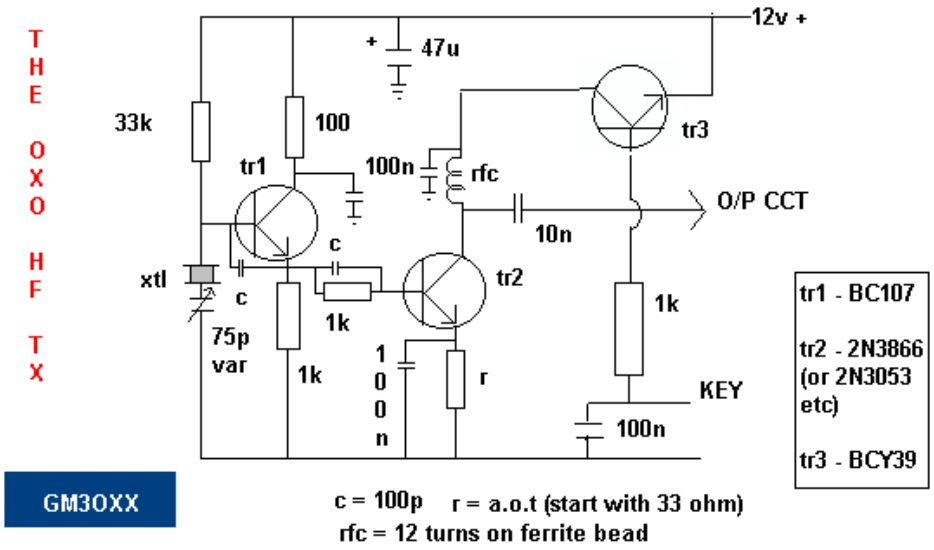


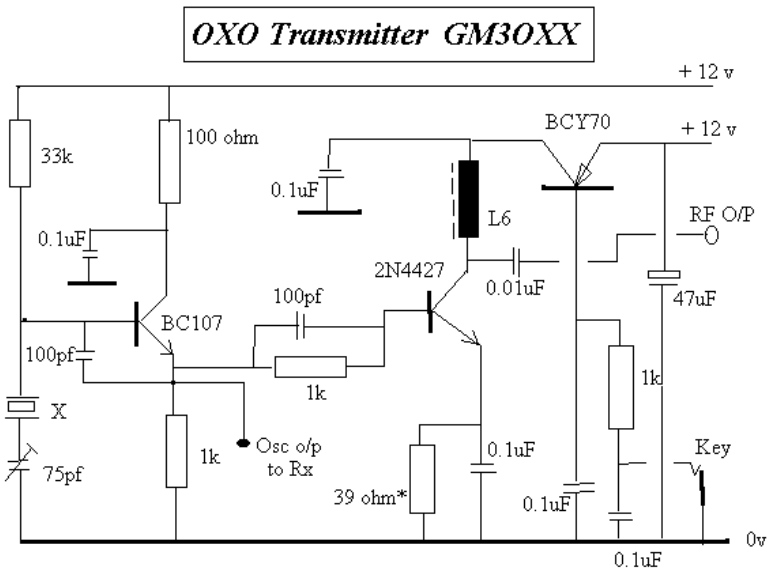


Transmitters

THE OXO:

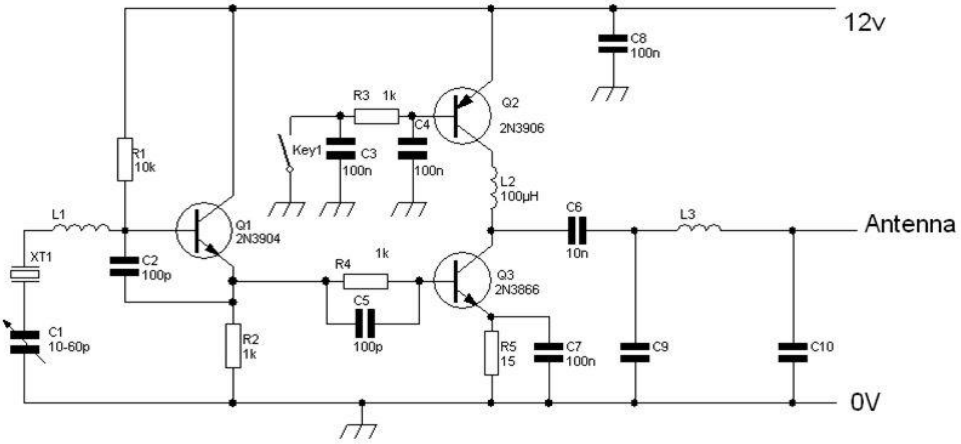
It's a simple transmitter designed by GM2OXX. It consists of 3 transistors, and has VXO. The output power is about 1 watt. It can be considered as a basic module and then build other RTXs by putting together a receiver module. There are various projects that do this, always available on the net, and very instructive to read and study.



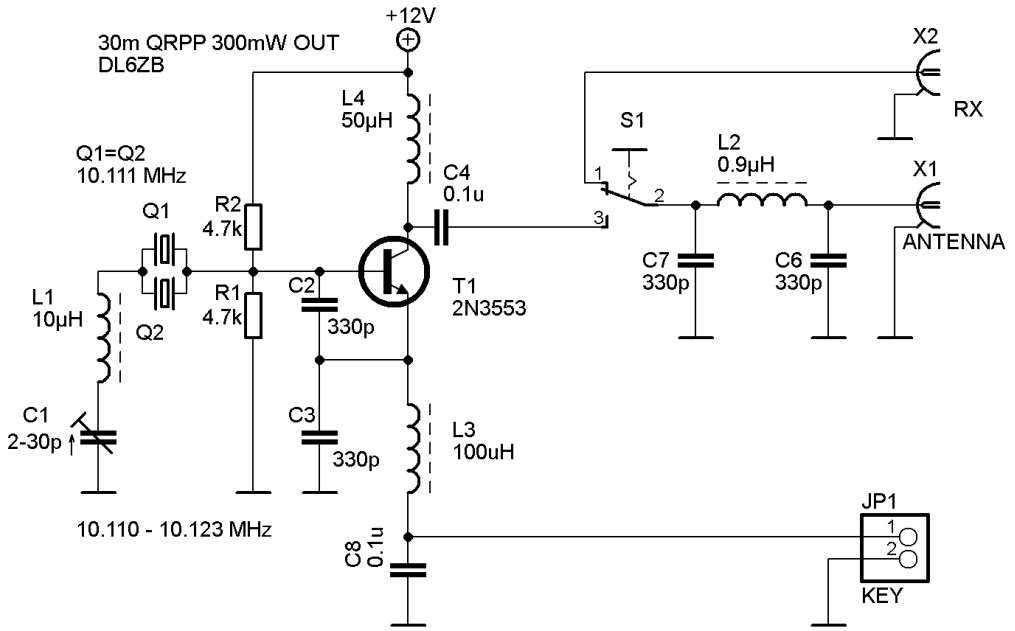


OXO HF QRP Transmitter

Any HF band, 1W, VXO controlled

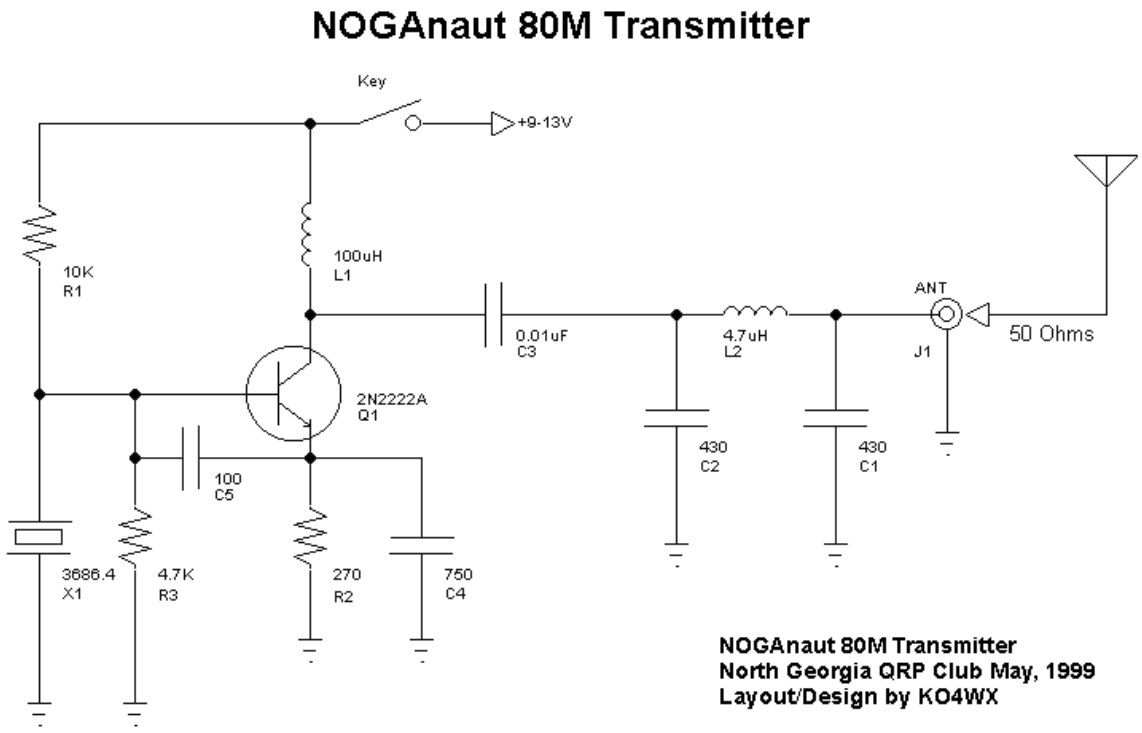


30 m QRPp TX by DL6ZB

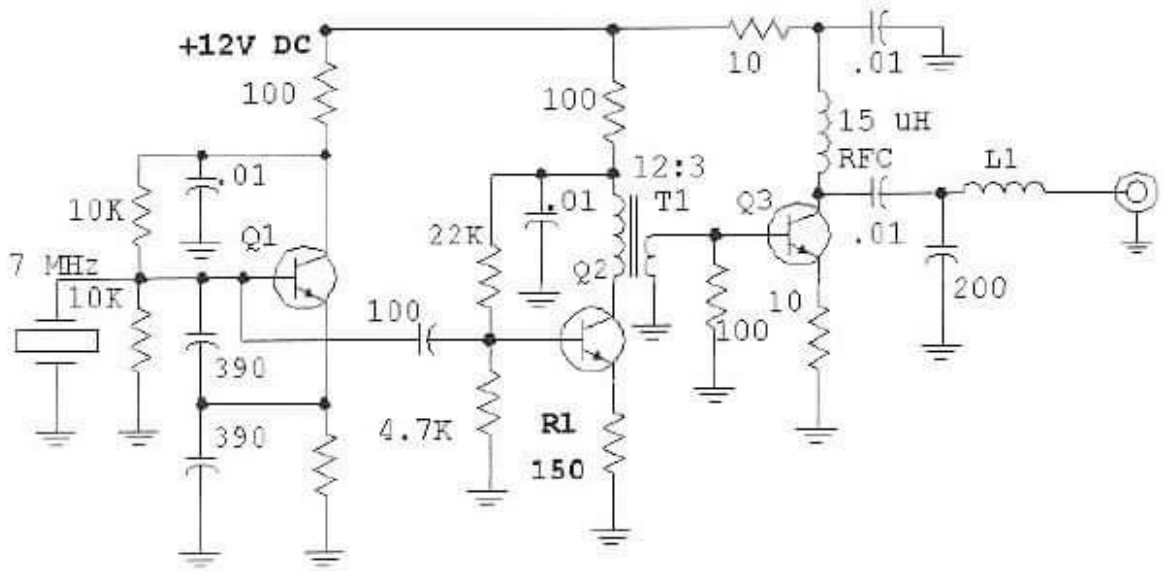


THE NOGAnaut

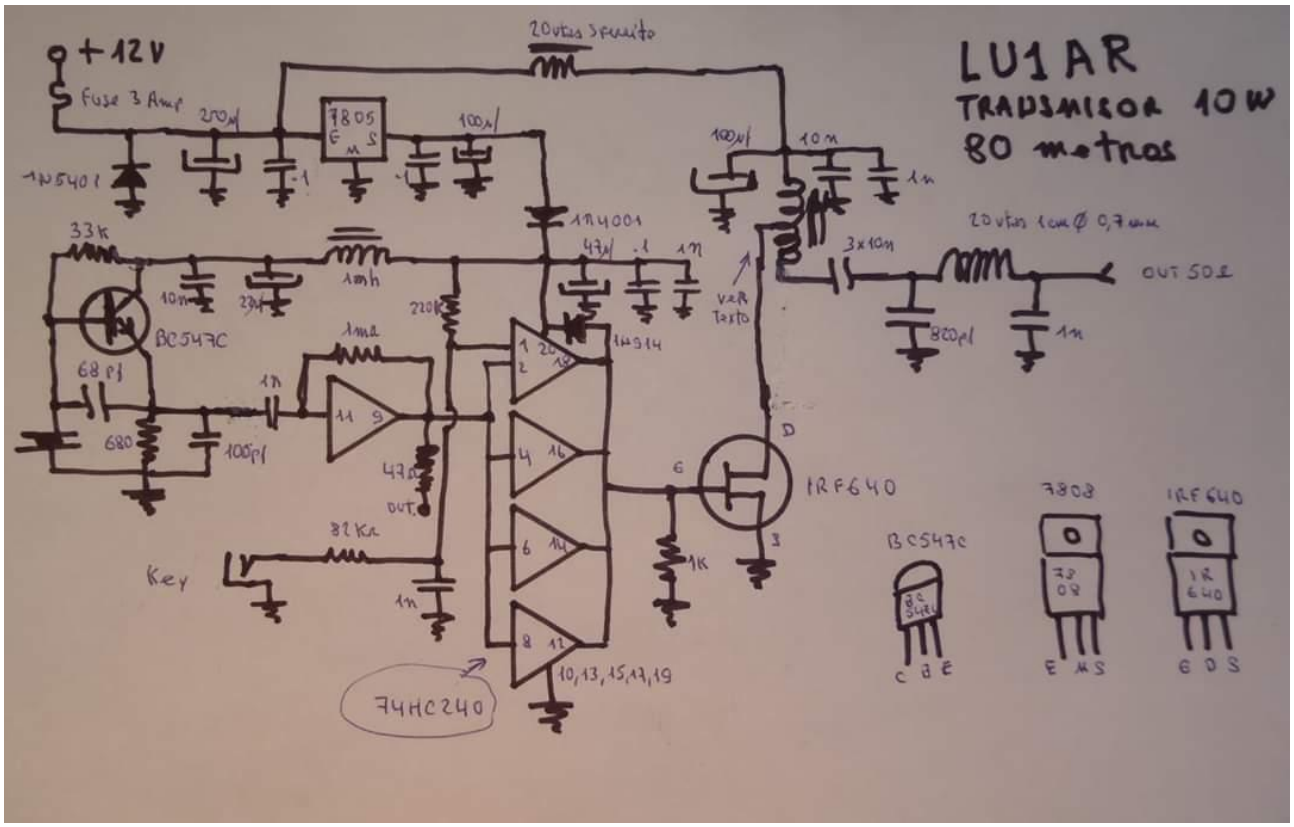
100 mW transmitter, very simple; references on the North Georgia QRP Club link, by KO4WX



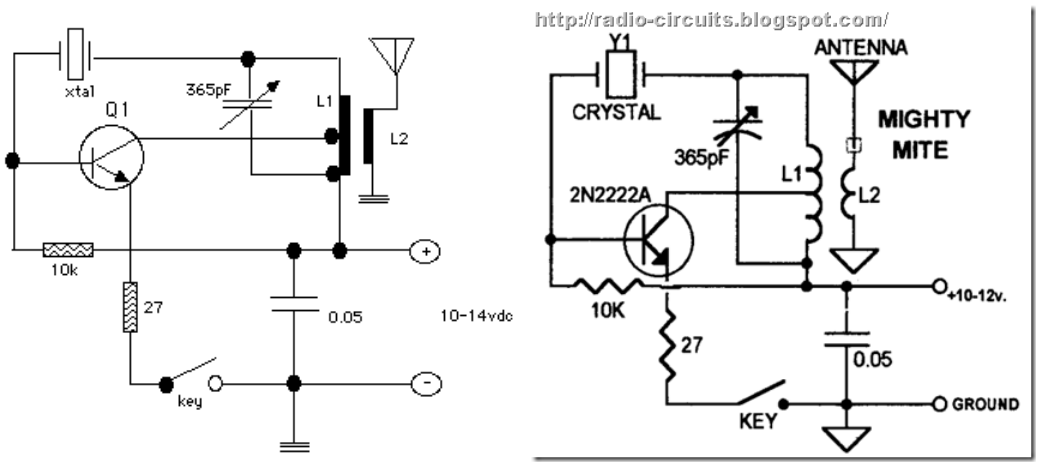
VA3IUL TX



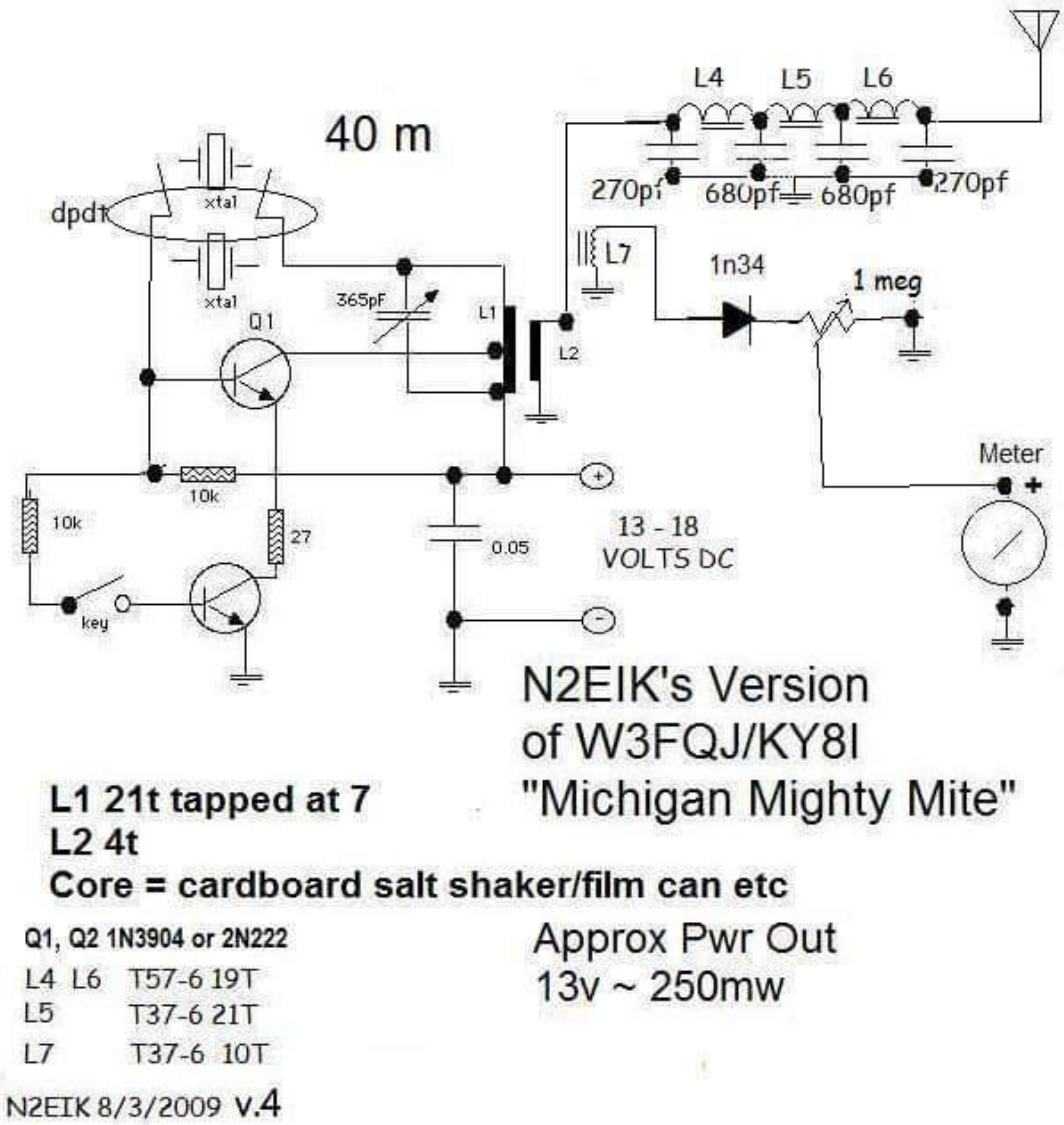
LU1AR RTX 10W 80m



The Michigan Mighty Mite

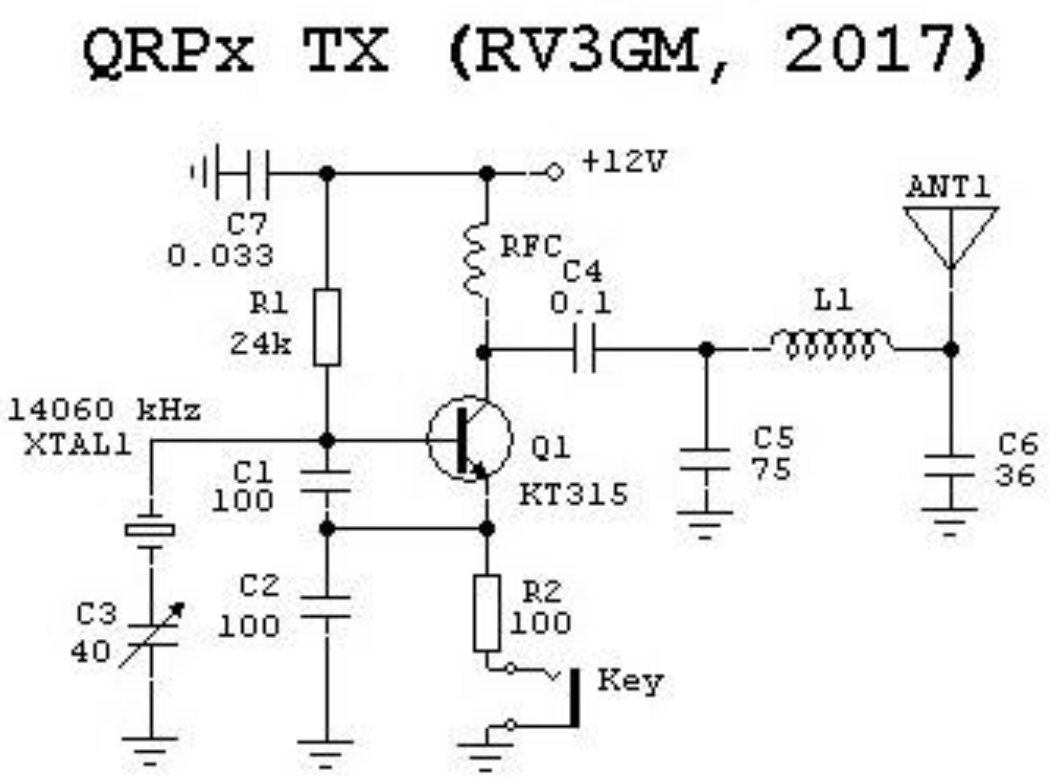


Minimalist transceiver that can deliver some from some milliwatt to 1 watt.

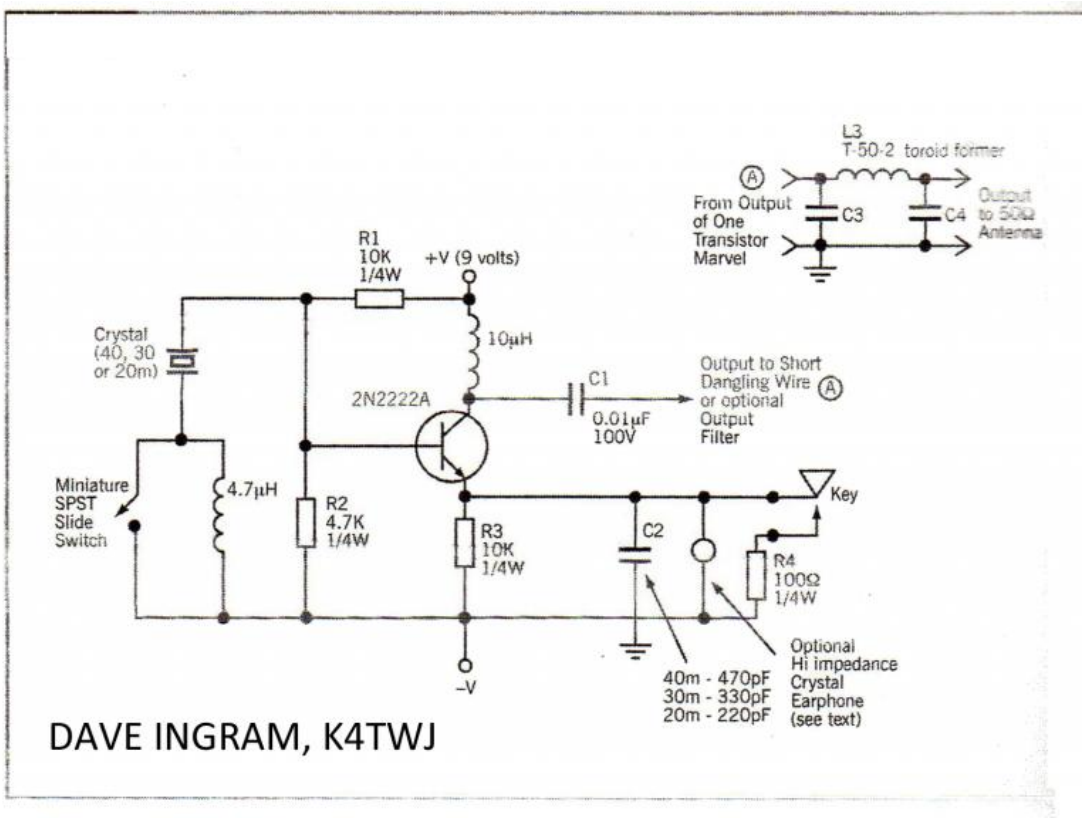


The Vanguard

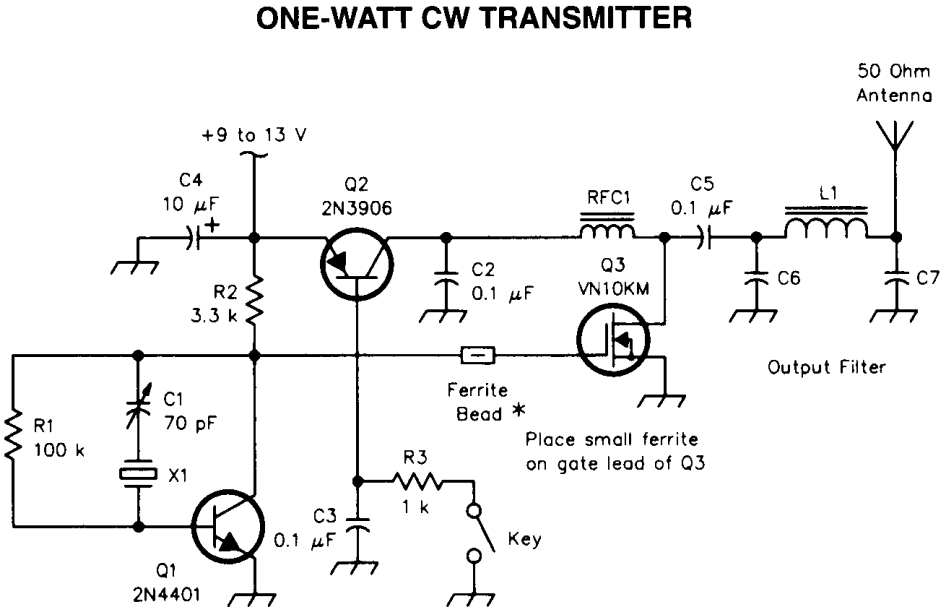
The Vanguard is a simple one transistor transceiver (by Oleg Borodin, RV3GM), which can give about 100mW or under 100mW. Mostly used in 20m and for QRPx.



One BJT Transmitter by K4TWJ



One Watt CW Transmitter



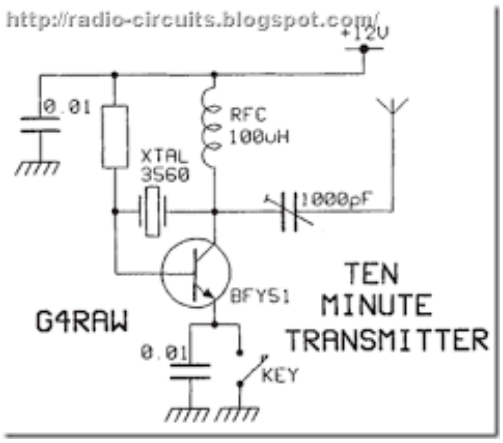
C6,C7

820 pF disc ceramic (160 meters)
470 pF disc ceramic (80 meters)
220 pF disc ceramic (40 meters)
150 pF disc ceramic (30 meters)
100 pF disc ceramic (20 meters)
82 pF disc ceramic (17 meters)

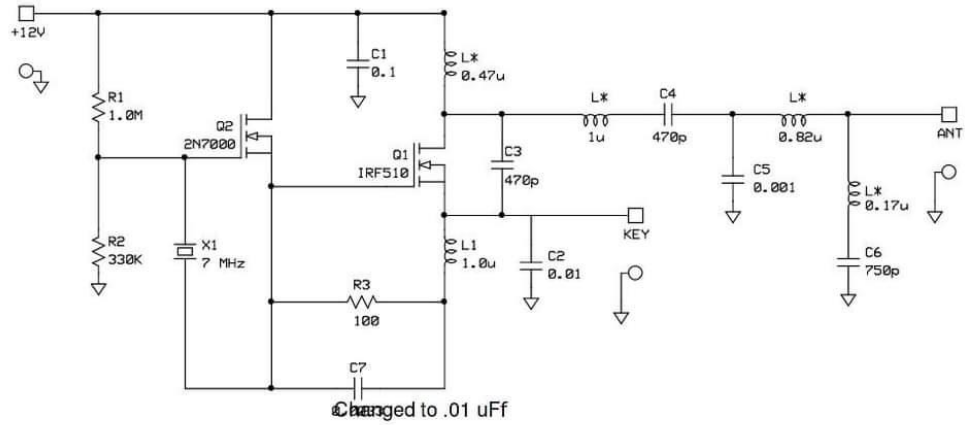
L1

33 turns, #30, T37-2 (160 meters)
23 turns, #30, T37-2 (80 meters)
17 turns, #26, T37-2 (40 meters)
14 turns, #26, T37-2 (30 meters)
12 turns, #26, T37-2 (20 meters)
10 turns, #26, T37-2 (17 meters)

Ten Minute Transmitter

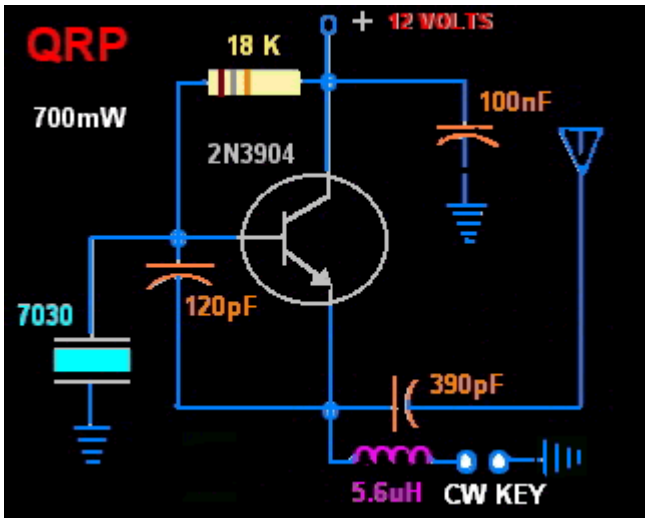


Four States QRP

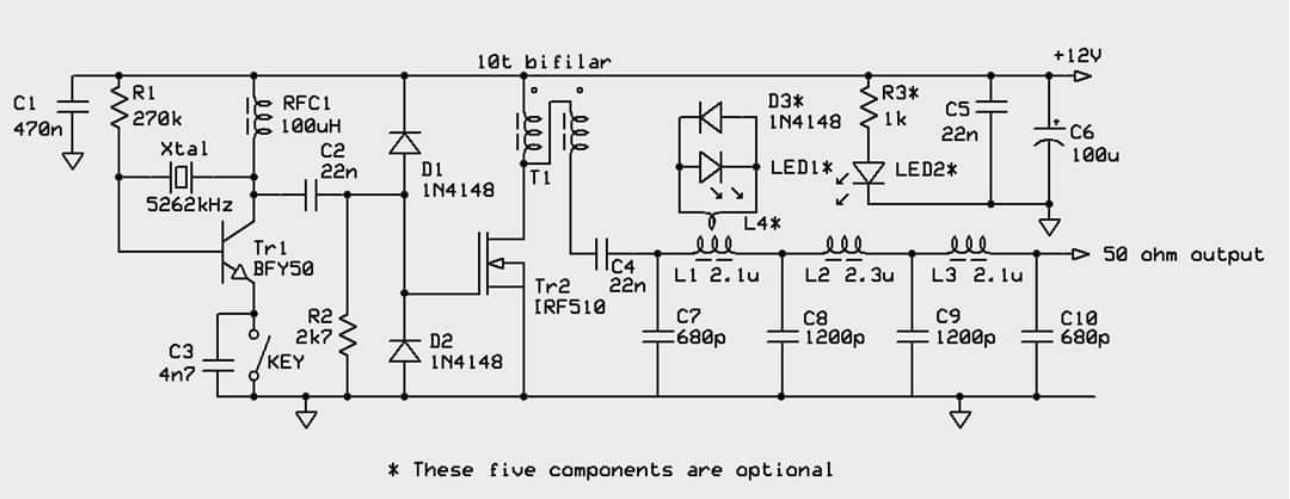


Four States QRP		
NS-40		
D. Cripe NM0S	Rev 1.0 5/30/2008	Page 1 of 1

One BJT Transmitter 700 mW



TX 5 MHz



PARTS LIST

C1	470nF
C2	22nF
C3	4.7nF
C4	22nF
C5	22nF
C6	100µF
C7	680pF ceramic or mica
C8	1200pF ceramic or mica
C9	1200pF ceramic or mica
C10	680pF ceramic or mica
D1	1N4148
D2	1N4148
D3	1N4148 (optional)
L1	2.1µH 20 turns on FT50-2
L2	2.3µH 21 turns on FT50-2
L3	2.1µH 20 turns on FT50-2
L4	2 or 3 turns over L1 (optional)
LED1	(optional)
LED2	(optional)
R1	270kΩ
R2	2.7kΩ
R3	1kΩ (optional)
RFC1	100µH (see text)
T1	10 turns bifilar on FT50-10 (see text)
Tr1	BFY50 with heatsink
Tr2	IRF510 with heatsink
Xtal	5262kHz (I can supply the crystal @ 60p each plus 70p post)

Little Joe

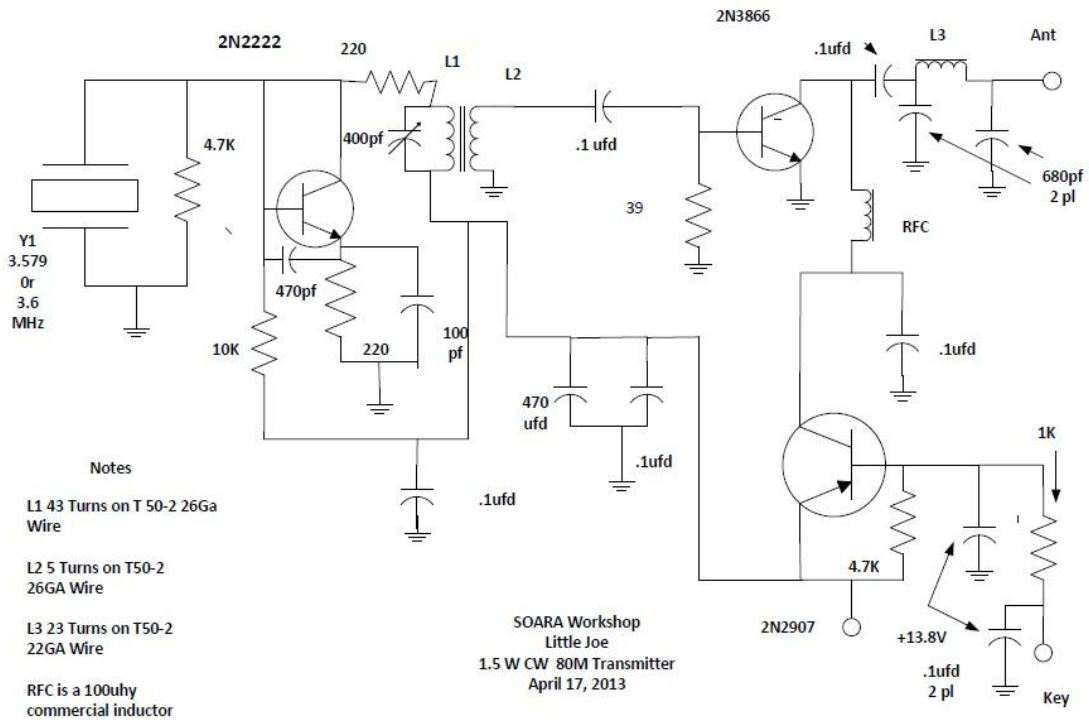
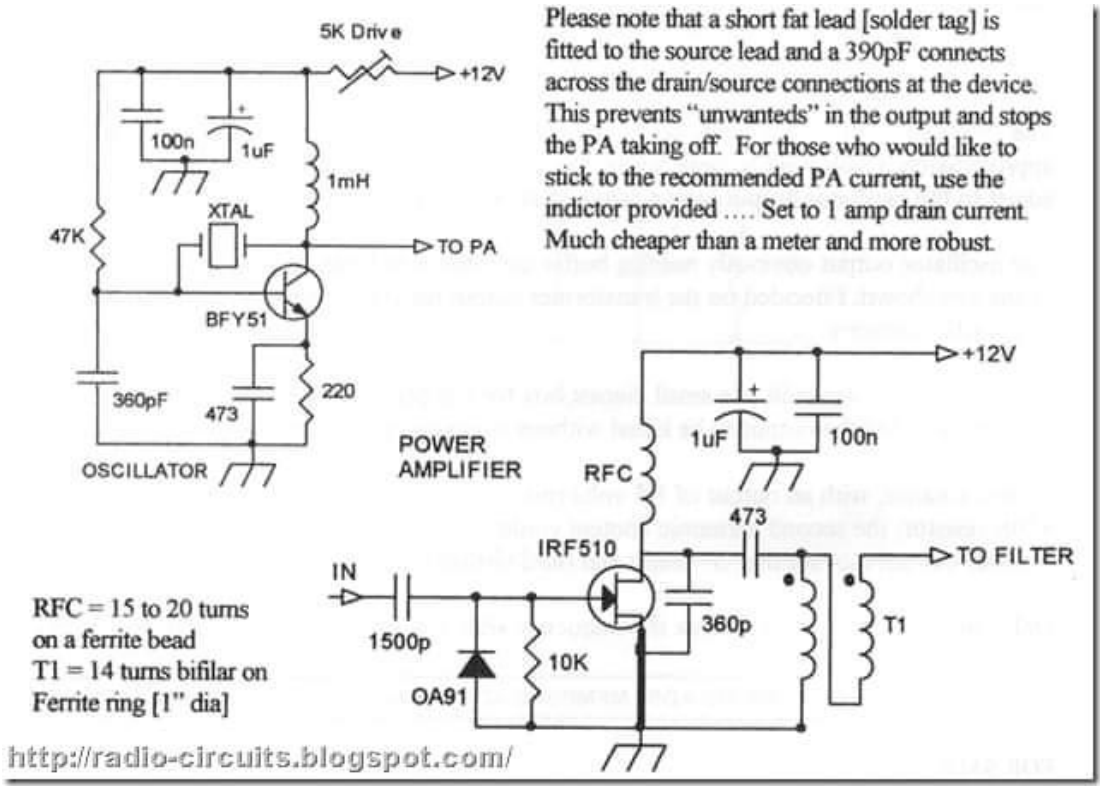
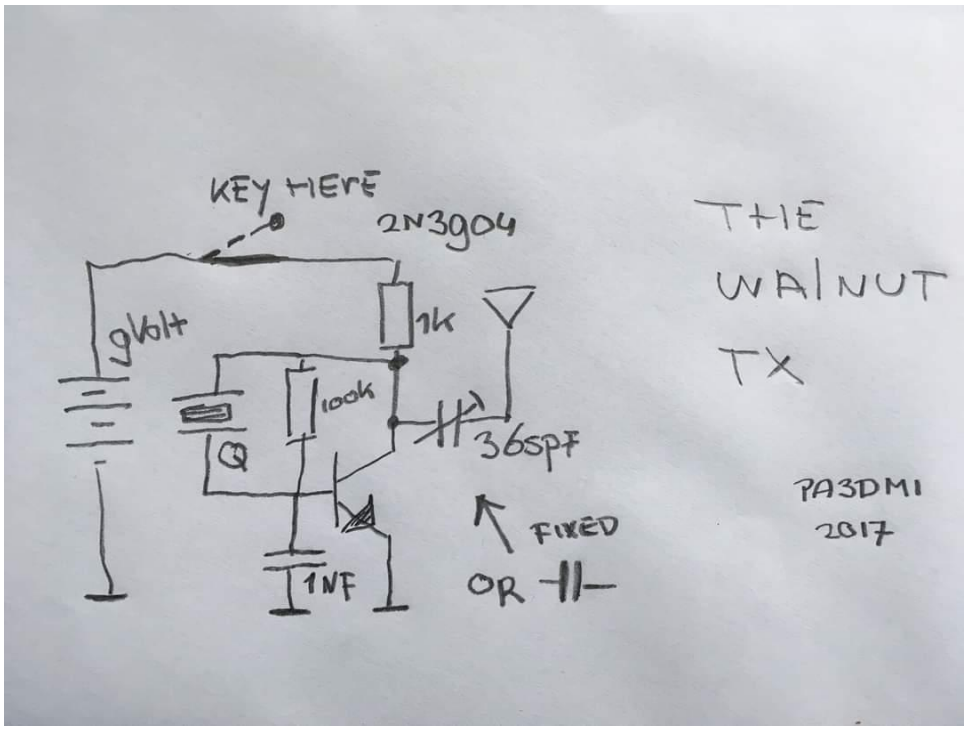


Figure 1
Little Joe Schematic

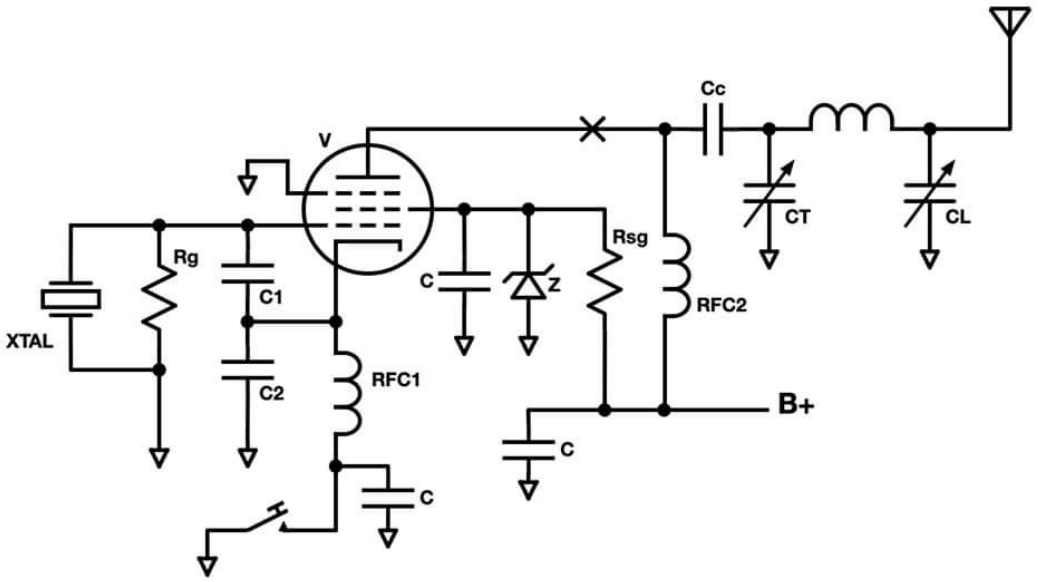
TX and power amplifier



The Walnut TX by PA3DMI



Valvular TX



C bypass capacitor, .001 to .01, 500V minimum
C1 22 pF
C2 220 pF
Cc plate coupling capacitor, .001 to .01, 1000V minimum recommended
CT tuning capacitor, 150 to 250 pF (see notes)
CL loading capacitor, 750 to 1200 pF (see notes)

L tank circuit inductance (see notes)

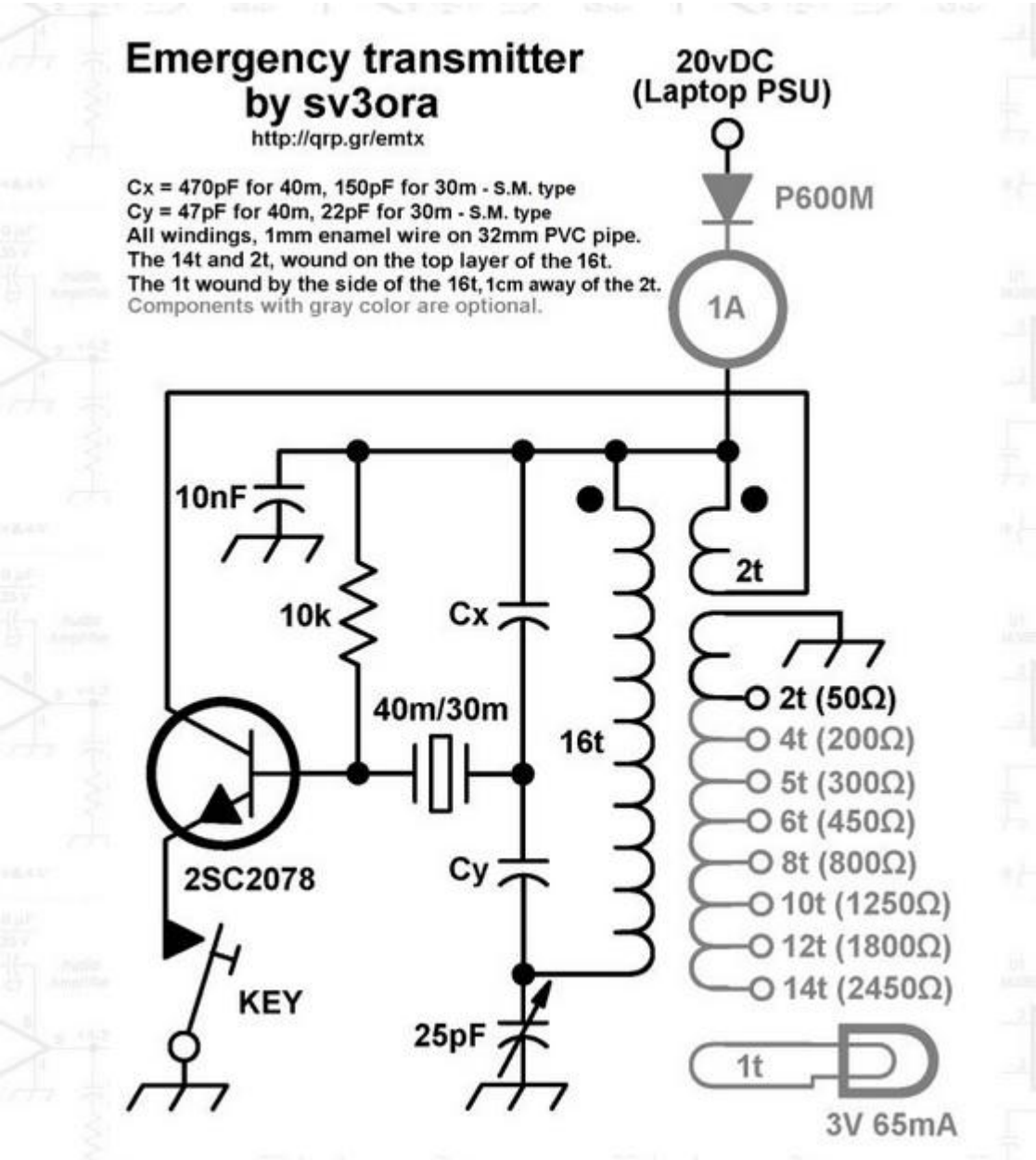
Rg grid resistor, 47k to 68k
Rsg screen grid resistor (see notes)

RFC1 1mH or 2.5mH, rated for cathode current
RFC2 1mH or 2.5mH, rated for plate current and B+

V oscillator tube, e.g. 6AG7, 6CL6, 5763, 12BY7A, etc (see notes)

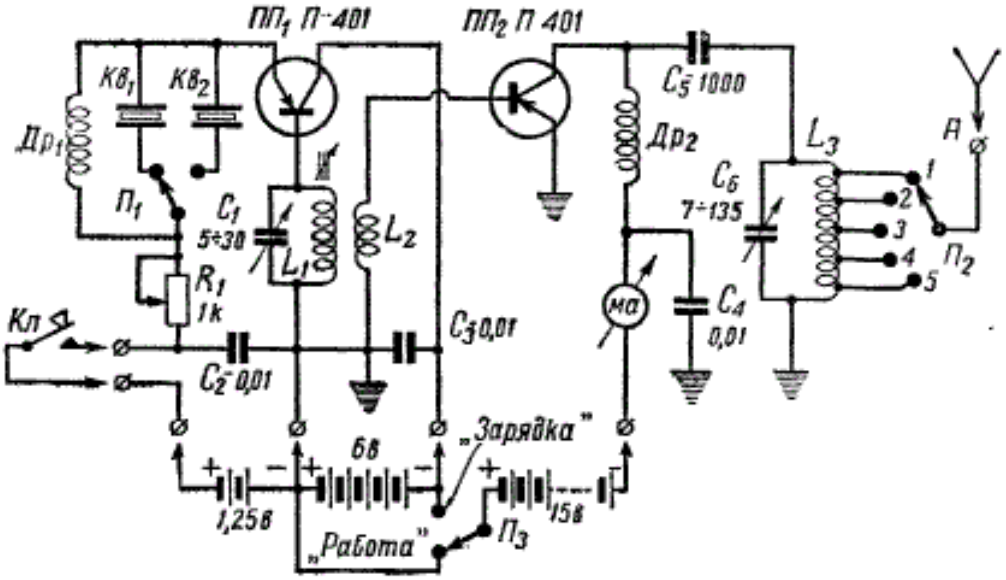
Z zener diode rated for screen voltage (optional, see notes)

Emergency transmitter – A 8 components 10W 40m/30m TX by SV3ORA

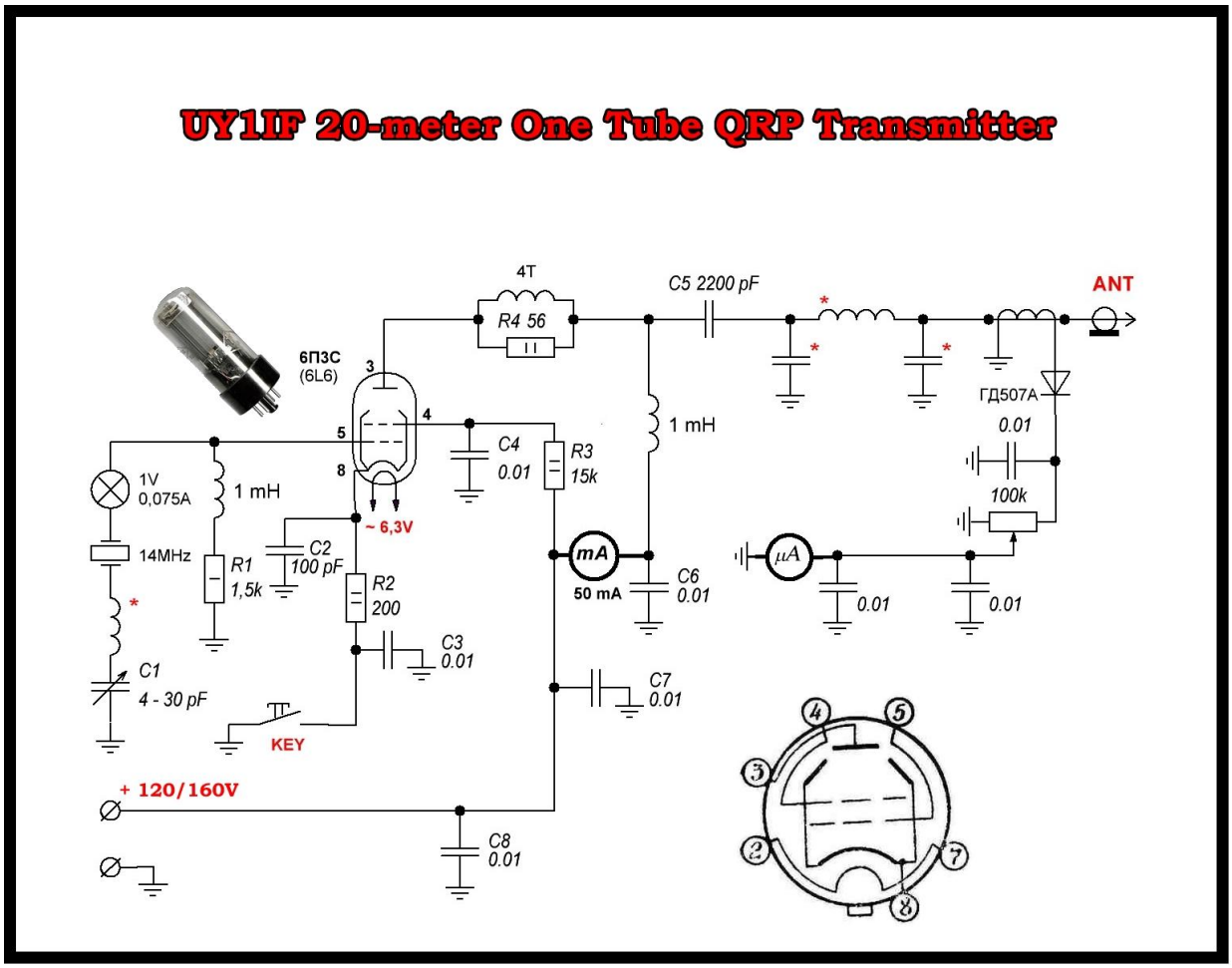


Components in grey are optional.

Russian transmitter “Paloma”



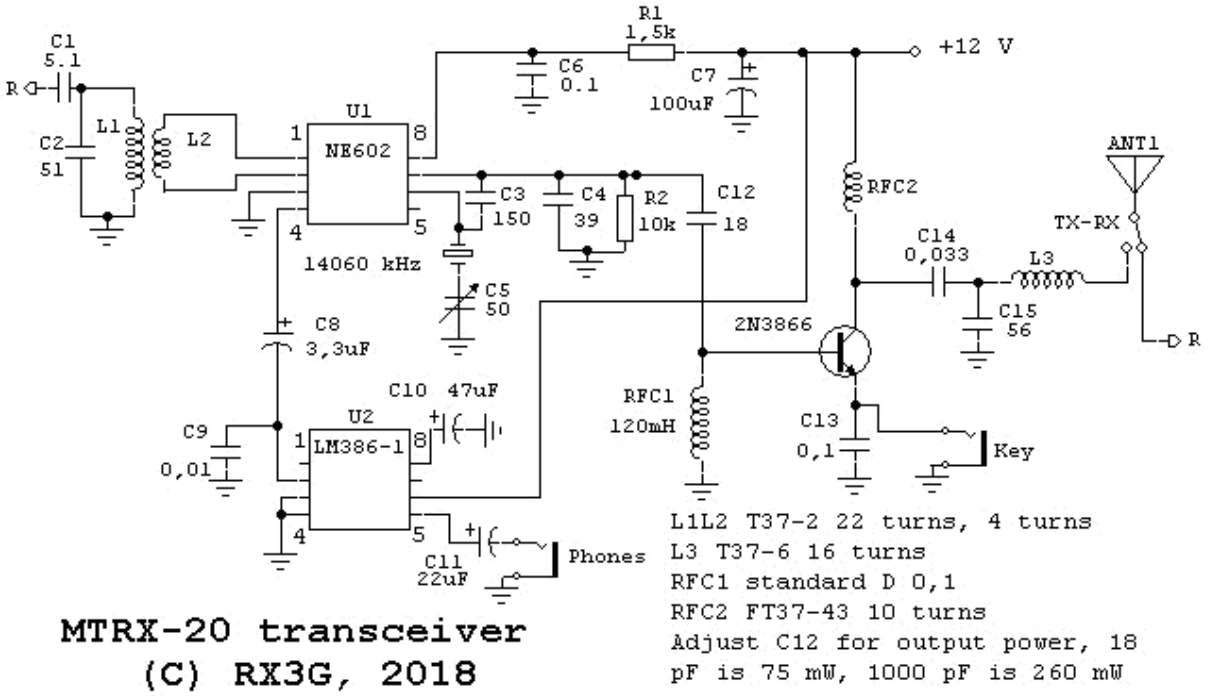
20 m 1 tube QRP Transceiver by UY1IF



Receivers

MTRX-20

It uses the NE602 as mixer and oscillator; it also uses the LM386 as audio amplifier. The output power can be modified by adjusting C12.



The power is obtained with an oscillator based on 2N2222; quartz for the 80 meters.

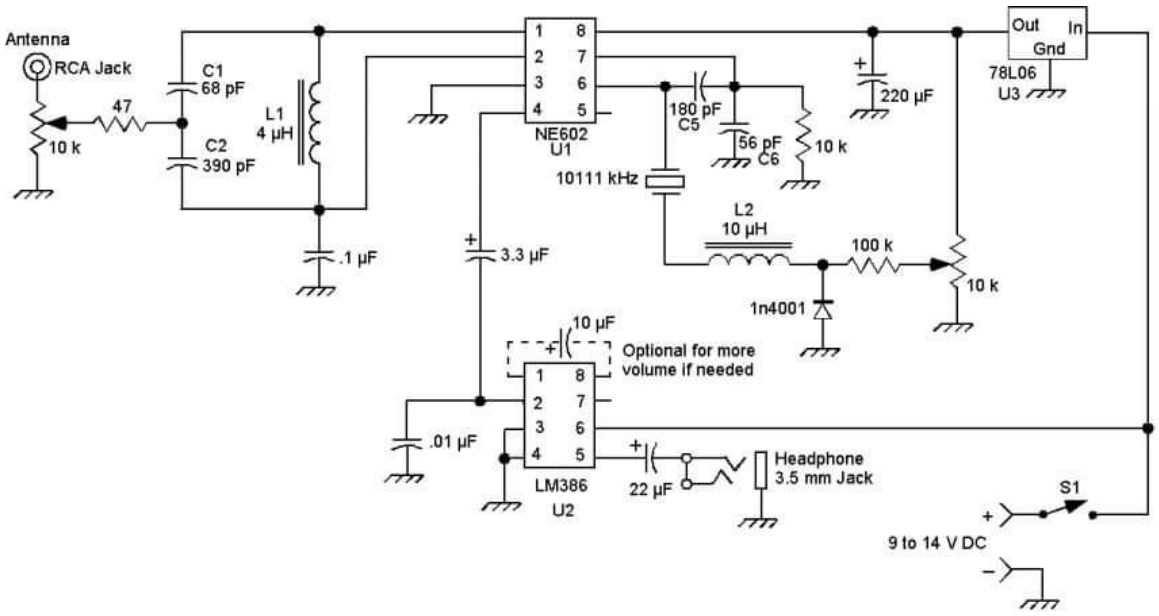
The TX can be coupled with the "very simple" MRX-40 receiver modified for 80 meters:

http://www.arrl.org/files/file/Technology/pdf/80MRX40.pdf

With these two modules you can have a truly minimalist RTX!

MRX-30

A receiver for 30 meters.



MRX-30 (Uses modified Far Circuits MRX-40 PCB)
Chuck Carpenter, W5USJ, 27 Aug '02

All resistors in ohms, 1/4 Watt

L1 - 32T 30 ga on T37-6 Toroid
L2 - 6T 26 ga on FT37-43 Toroid

Note:
All parts except C1, C2, C5, C6, L1, L2, U1 and U2 are the same as those found in the original article by Steve Bornstein, K8IDN in QST, September 1997

Also, see the articles in QRP Quarterly January 2001 page 22 and July 2001 page 20. (This one shows July on the cover and April 01 inside.)

Capacitors and resistors purchased from Mouser. Toroids and ICs purchased from Dan's Small Parts. Hardware, jacks and crystal come from a variity of places.

MRX-40

A receiver for 40 meters.

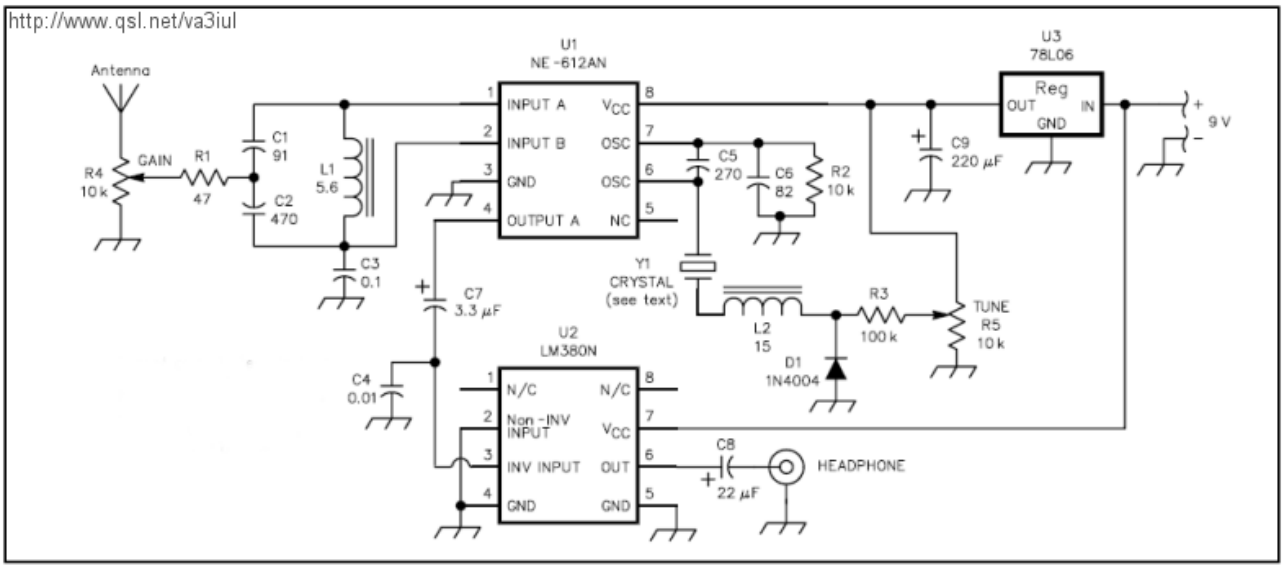
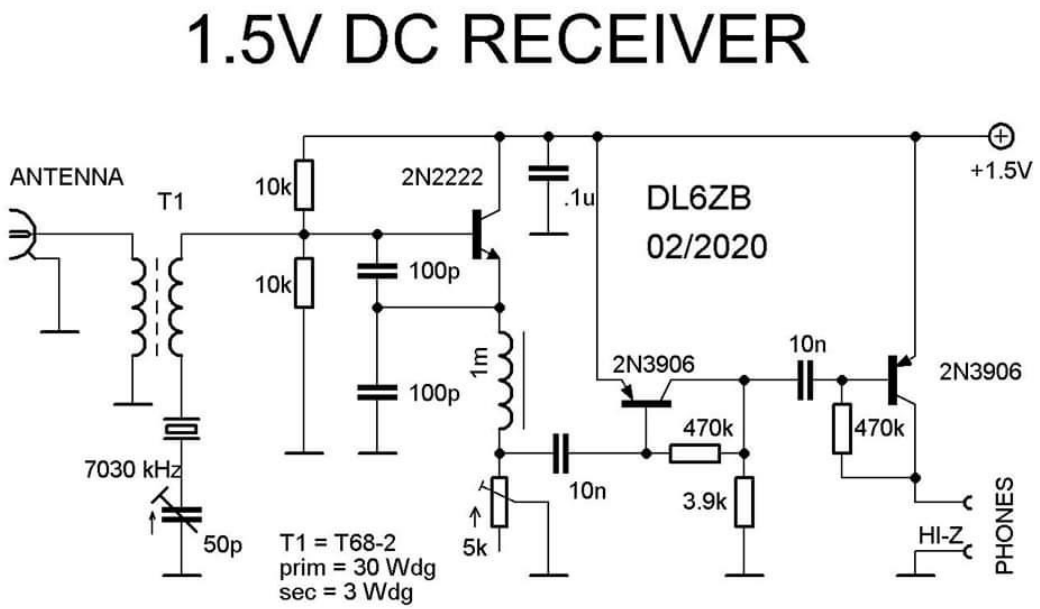


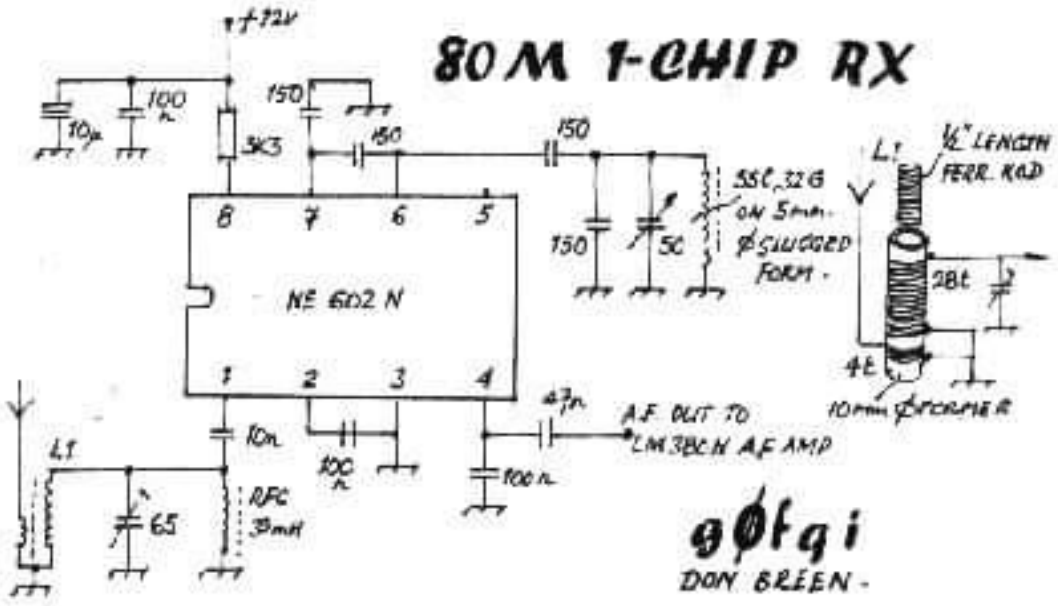
Figure 1—Schematic of the MRX-40 receiver. Equivalent parts can be substituted. With the exceptions noted below, all parts are available from Mouser Electronics, 958 N Main St, Mansfield, TX 76063-4827; tel 800-346-6873.

C1—91 pF ceramic disc capacitor (Mouser 140-CD50S2-091J)
C2—470 pF ceramic disc capacitor (Mouser 140-CD50P2-471K)
C3—0.1 µF monolithic capacitor (Mouser 581-UDZ104K1)
C4—0.01 µF monolithic capacitor (Mouser 581-UEZ103K1)
C5—270 pF monolithic capacitor (Mouser 581-UEC271J1)
C6—82 pF monolithic capacitor (Mouser 581-UEC820J1)
C7—3.3 µF electrolytic capacitor (Mouser 208-50V3.3)
C8—22 µF electrolytic capacitor (Mouser 208-50V22)
C9—220 µF electrolytic capacitor (Mouser 208-10V220)
D1—1N4004 (Mouser 592-1N4004A)
L1—5.6 µH molded choke (Mouser 43LS566)
L2—15 µH molded choke (Mouser 43LS155)
R1—47 Ω, 1/4 W resistor (Mouser 30BJ250-47)
R2—10 kΩ, 1/4 W resistor (Mouser 30BJ250-10K)
R3—100 kΩ, 1/4 W resistor (Mouser 30BJ250-100K)
R4, R5—10 kΩ potentiometers (Mouser 317-2091-10K)
U1—NE-612AN (Dan's Small Parts, Box 3634, Missoula, MT 59806; tel 406-258-2782; http://www.fix.net/dans.html)
U2—LM-380N-8 (Dan's Small Parts; see U1)
U3—78L06ACZ voltage regulator (Mouser 511-78L06ACZ)
Y1—Crystals in HC49U holders for 7040 or 7122 kHz are available for $3 each from Doug Hendricks, KI6DS, 862 Frank Ave, Dos Palos, CA 93620.

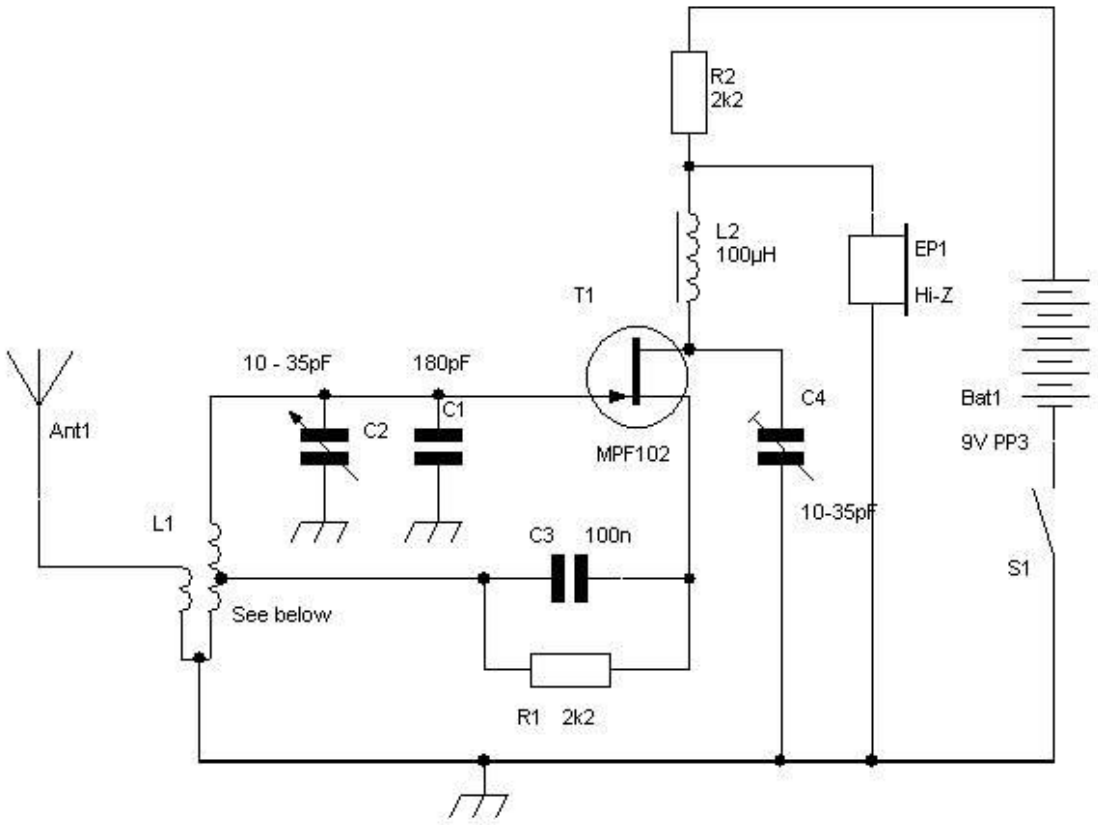
1,5 V DC Receiver by DL6ZB



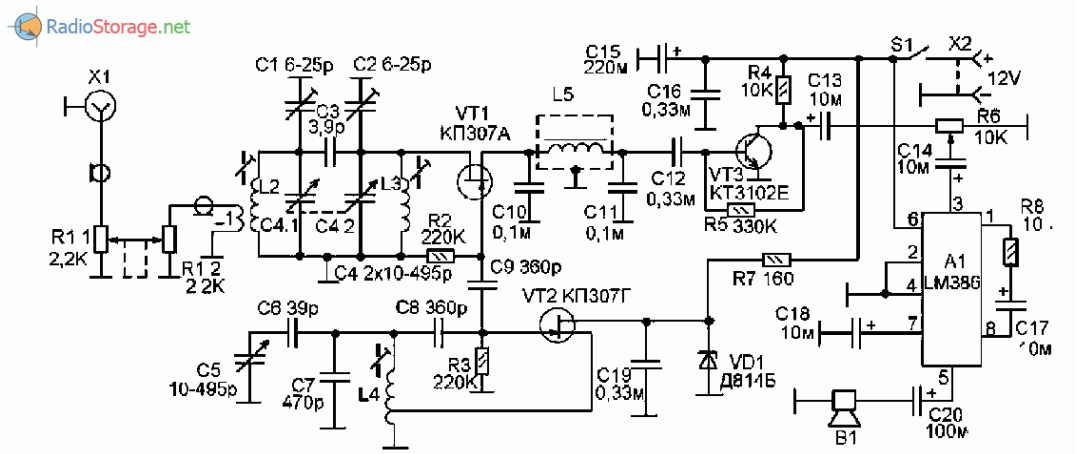
1 CHIP RX 80 m by G0FGI



A REGEN RECEIVER:



Russian DC RX



Russian DC RX 2

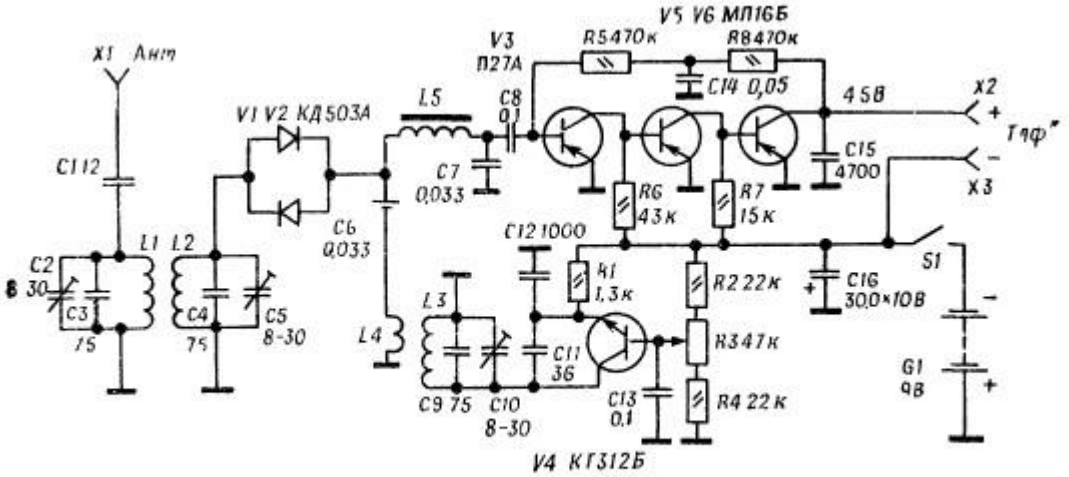
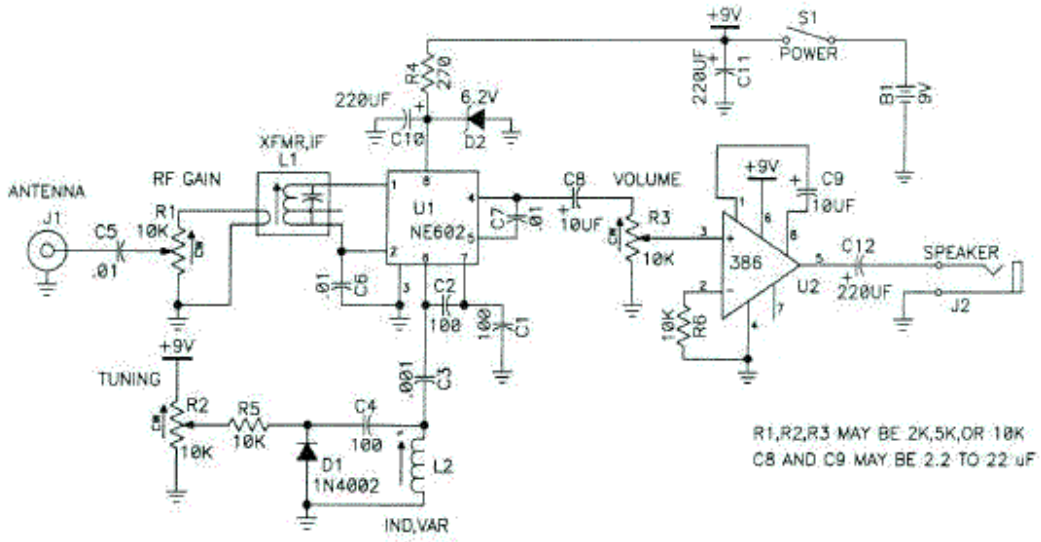
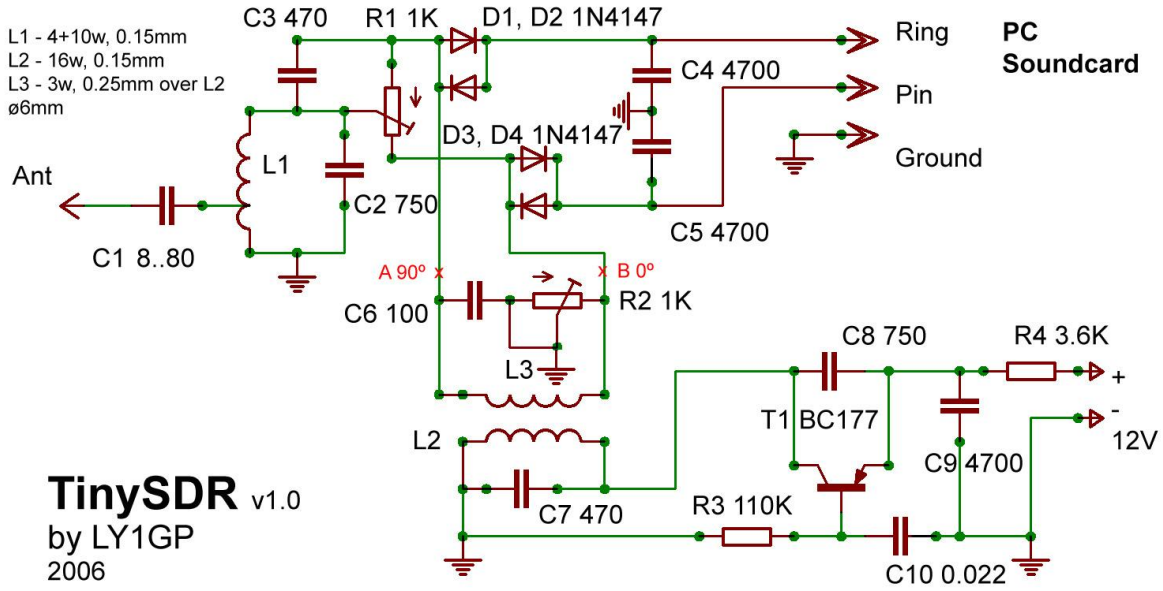


Рис 43 Принципиальная схема простого приемника

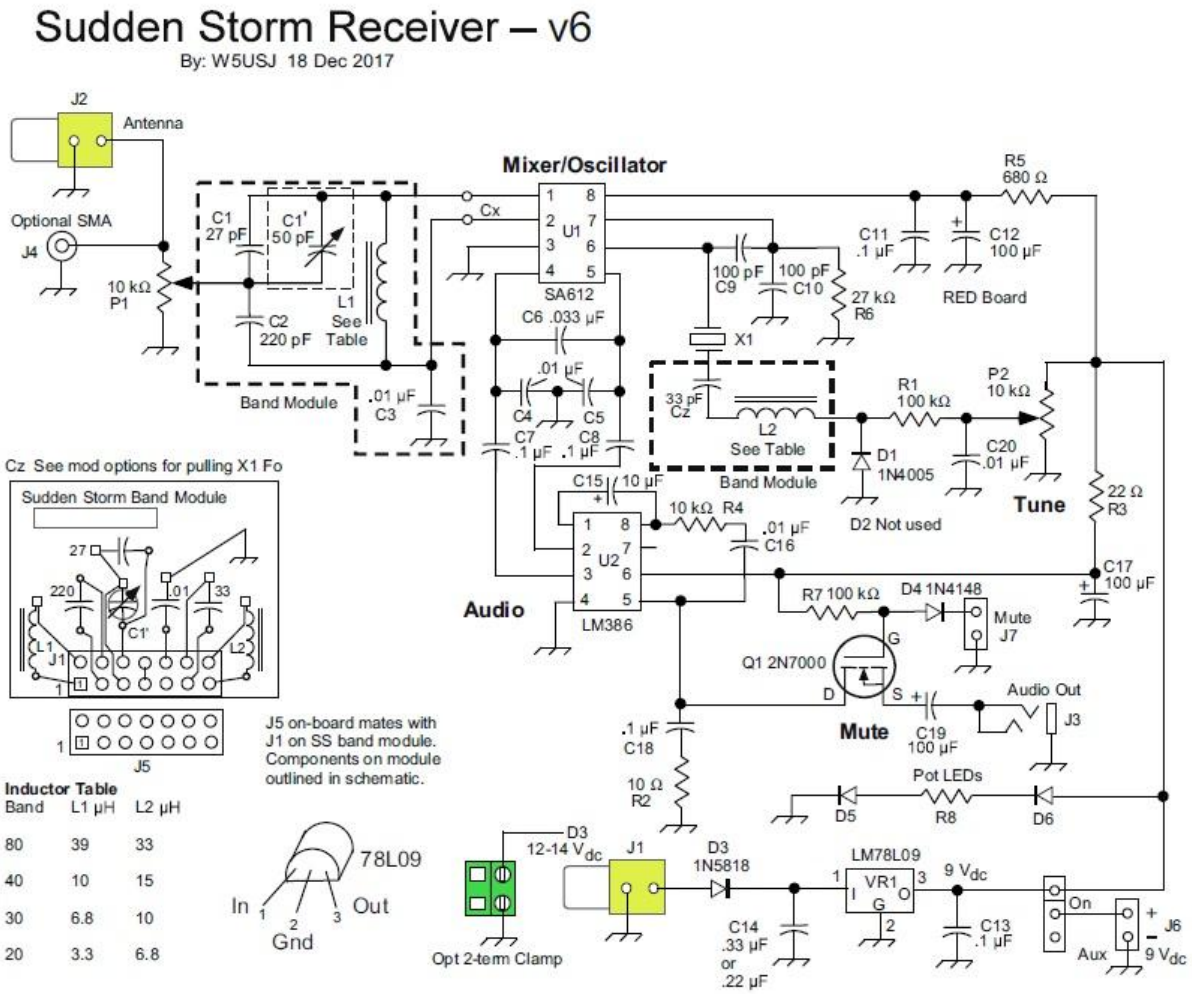
RX 69



Tiny SDR by LY1GP



Sudden Storm Receiver

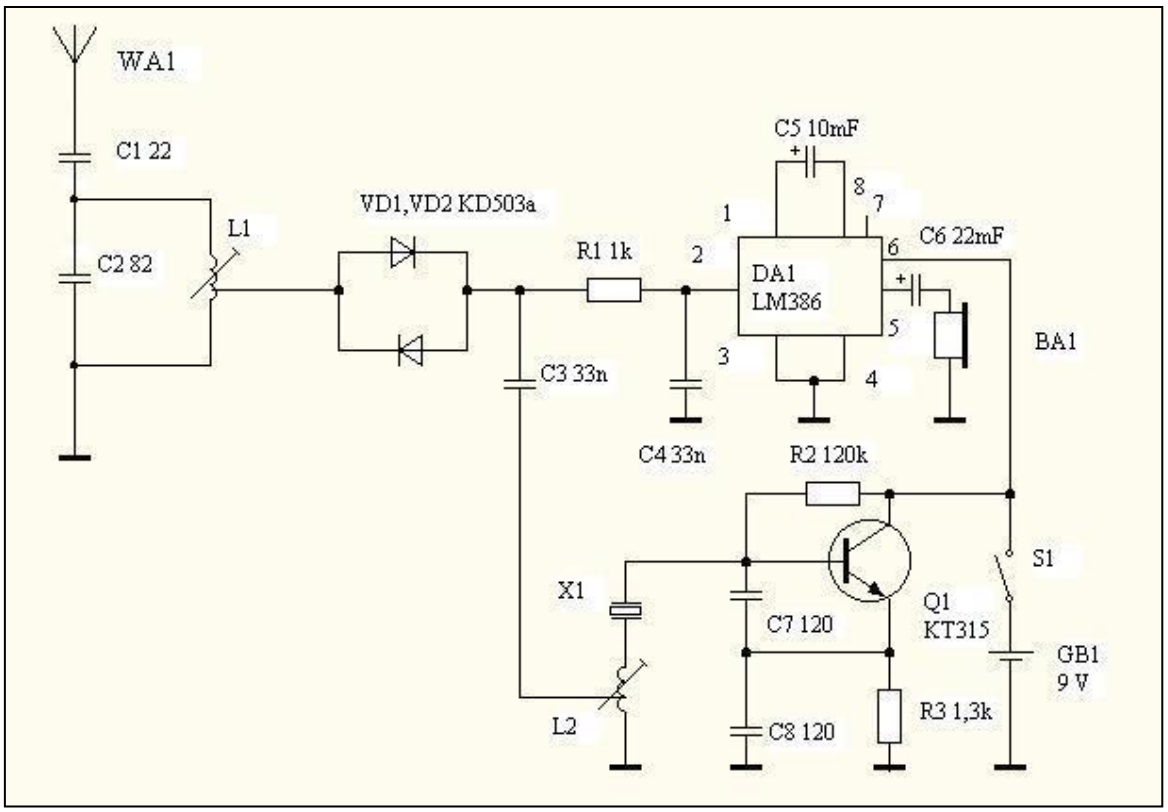


The “Micro-Scope” - very simple 20 m D.C. RX for portable operation

Oleg V. Borodin RV3GM P.O. Box 229, Lipetsk, 398043, Russia
For “W1FB” Memorial 2004

This is direct conversion receiver for 20 m band QRP calling frequency 14060 kHz. The mixer on opposing - parallel diodes here is used. The VXO generate the twice-below frequency (xtal for 7030 kHz used).

Note this receiver may be used for any frequency exchanged components L1, C2, X1, L2. Audio amplifier is brewed on well known LM386. Headphones or a small speaker 8 to 32 Ohms may be used. Components R1 C3 C4 are low-pass audio filter. Receiver powered with 9 V batteries.



L1 & L2 wound on PVC cores 6 mm dia with ferrite screw, wires 0,27 mm dia. Both inductors have 18 turns with tap from 5'th turn of the "ground" points. VD1&VD2 may be any RF silicon type. Q1 may be 2N2222 or 2N3904.

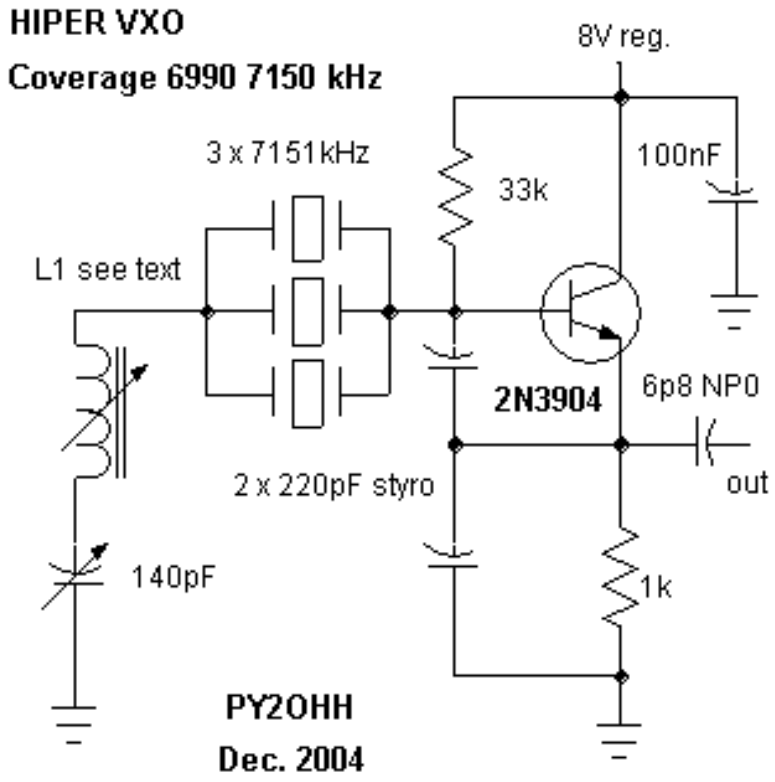
Receiver brewed on a piece of PCB by "dead bug" method and may enclose to any metal box or soldered on PCB material box.

72! de RV3GM

Utilities

Il Super VXO

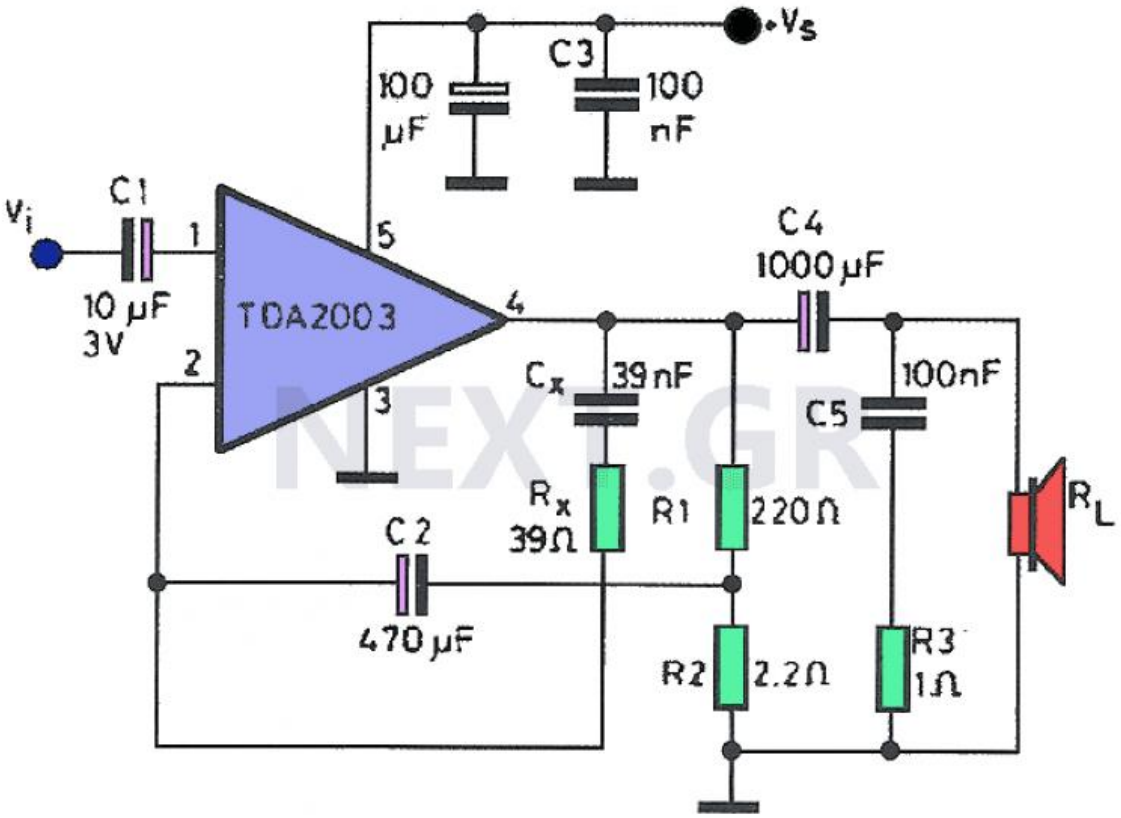
Usually the oscillator of the above schemes using a variable capacitor can shift its oscillation frequency by +/- 1 kHz or fraction of it; to have a higher bandwidth, of the order of 5-10 kHz or even more, you can use a super VXO, where there are more quartzes in parallel on the same frequency, and in series an inductor and a variable capacitor. Thie is a useful scheme, by PY2OHH:

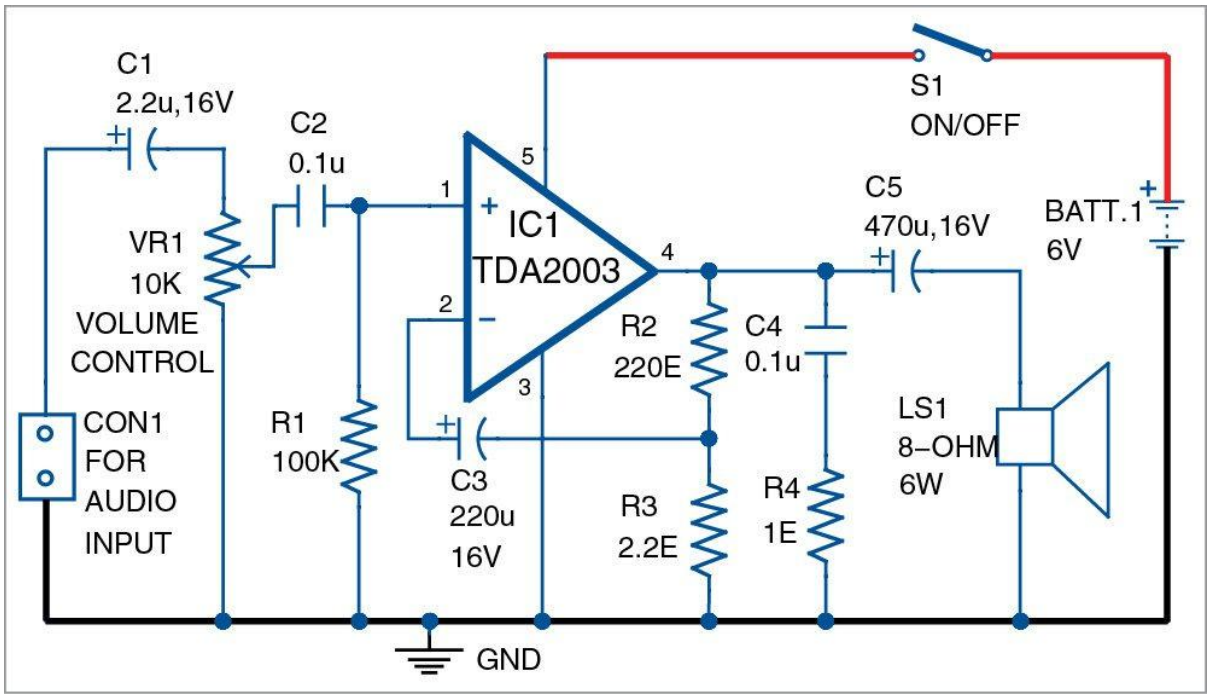


Audio Amplifier

If the audio signal of many proposed schemes is only suitable for headphone listening, it can be remedied with a small and cheap audio amplifier based on the TDA2003.

The TDA2003 was born as a car audio integrated amplifier, from about 10 watts; the schemes of use are very simple and two of them are reported; the supply voltage includes 12 - 13.8 V, but can be even higher (refer to the datasheet).


+Vs
C3
100 µF
100 nF
C1
Vi
10 µF 3V
TDA2003
1
2
3
4
5
C4 1000 µF
Cx 39 nF
100nF
C5
Rx 39Ω
R1 220Ω
RL
C2 470 µF
R2 2.2Ω
R3 1Ω


C1
2.2u,16V
C2
0.1u
S1
ON/OFF
VR1
10K
VOLUME
CONTROL
IC1
TDA2003
C5
470u,16V
BATT.1
6V
CON1
FOR
AUDIO
INPUT
R1
100K
C3
220u
16V
R2
220E
C4
0.1u
LS1
8-OHM
6W
R3
2.2E
R4
1E
GND

S-meter circuit